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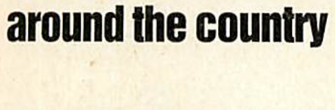
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COMMS
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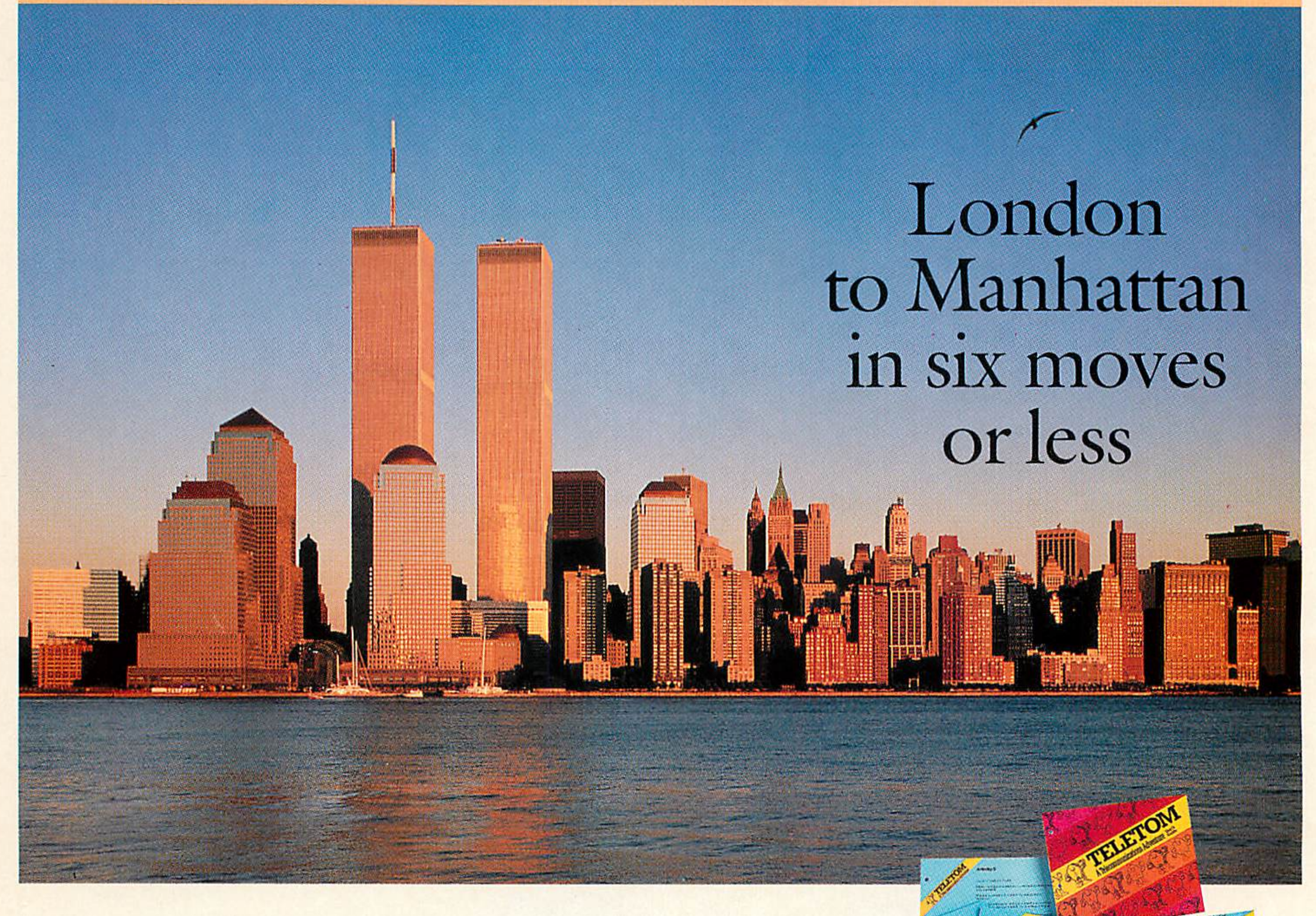
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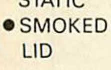
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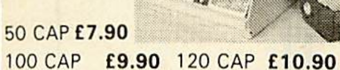
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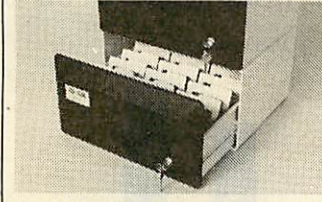
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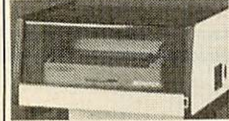
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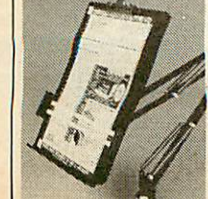
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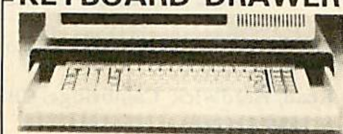
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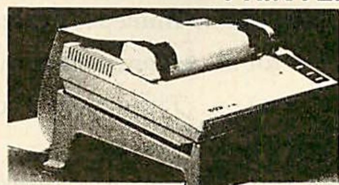
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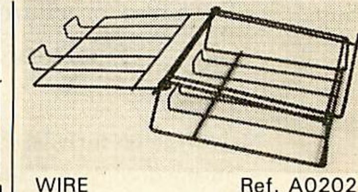
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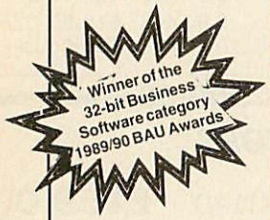


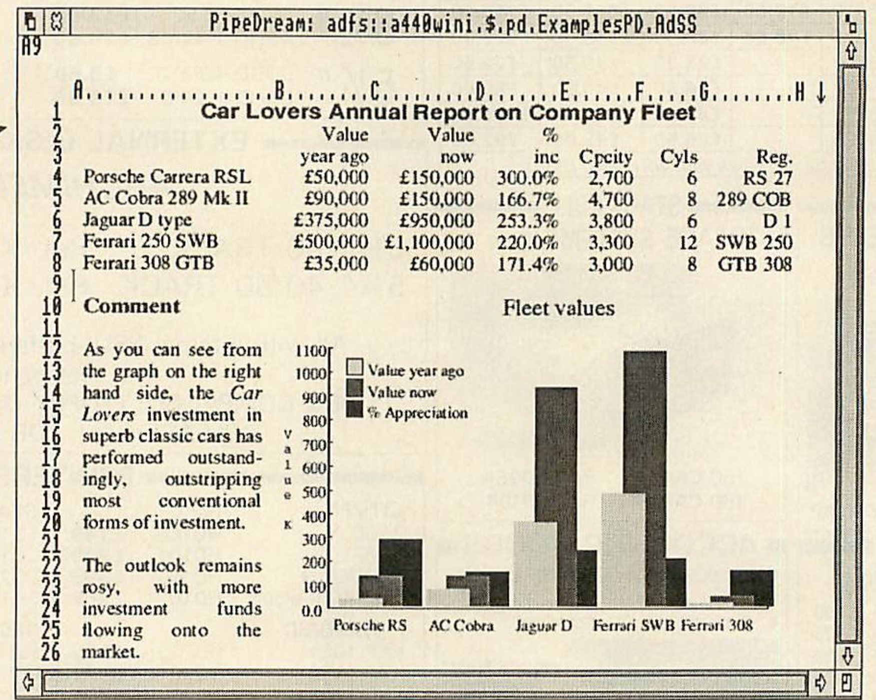
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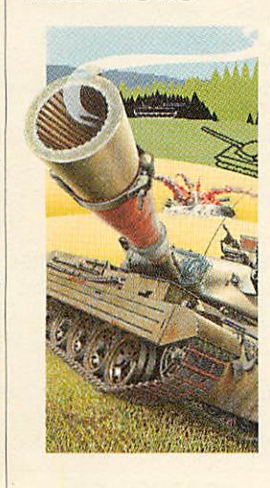
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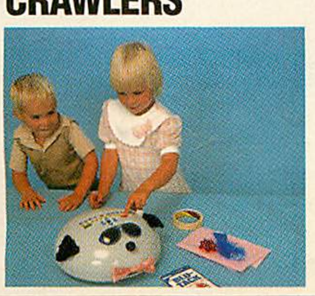
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TANK WARRIORS



Cover illustration by Richard Draper

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XMAS LAUNCH FOR ACTIVE BOOKS

Active Book Company plans to launch its first product soon after Christmas.

Matt Lee, one of the directors of Active Book Company, told *BBC Acorn User* that the first in a line of Active Books would incorporate a reflective display that is slightly smaller than A5. The resolution on the first model will be just good enough to read a fax, but the much talked about character recognition will only stretch to printed characters, not cursive writing. The learning process involved in character recognition is not as fast as some of the media have been speculating. According to Lee characters will have to be entered at a slow steady pace, and pointed out the example of stock entry as being an ideal application.

Central to the Active Book is Hercules, a multi-purpose chip which contains a static version of the Arm chip. Like the Z88, the Active Book will be able to go to sleep between key presses, thus conserving battery power.

The Active Book Company has signed a contract with Acorn Computers which will provide the company with access to Acorn's computer technology. The deal covers development tools as well as hardware and software. Also covered by the agreement is Acorn's Risc OS operating system.

Matt Lee pointed out to *BBC Acorn User* that Active Book Company is keen to talk to software developers interested in developing applications for the Active Book range.

'I am interested in talking to anyone with direct experience in software development around the Arm,' said Lee. Active Book is on (0223) 245200.

ARM3-BASED UNIX

Acorn computers has announced a new range of Arm 3 based Unix workstations which will be available in October.

Called the R200 Series, the machines were first shown at the European Unix User Show which was held in June.

The new machines are based on Acorn's Arm 3 chip, which is significantly faster than the existing Arm 2.

The chip also features 4K of on-board cache which further improves performance.

Two systems have been released so far, one a discless system, which is suitable as an intelligent terminal, and a top-of-the-range unit with 100Mb hard disc.

The R260 features 8Mb of Ram, expandable to 16Mb, and a 100Mb formatted fast-access internal SCSI hard disc. The discless R225 has 4Mb of Ram, which can be expanded to 8Mb.



Other hardware features common to both machines include Ethernet and thin Ethernet and an internal SCSI interface.

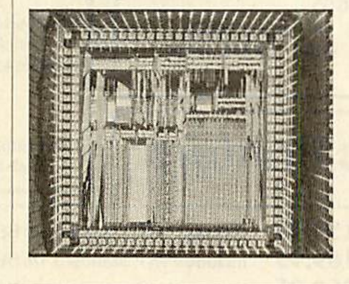
Besides the new hardware, the current version of the Unix operating system has been enhanced. The R200 series comes with Risc iX version 1.2 which is compliant with X/Open (XPG3) and is compatible with both System V and BSD environments.

The R225 costs £3,000 (ex VAT) and the R260 starts from £5,000 (ex VAT).

MICROSOFT MAY USE ARM

The Acorn Arm chip could be extensively used in the next generation of laser printers.

Microsoft and Apple have developed Trueimage, a competitor to Display Postscript. Postscript is the language that is used in the majority of laser printers throughout the world, but the monopoly looks set to be broken with the new standard. Trueimage, like Display Postscript and Acorn's Arc Draw routines, is a DTP screen image language. As its name suggests, it is a pure Wysiwyg language, allowing a DTP page to be viewed on-screen exactly as it would look in print.



Trueimage has currently been ported to four chip architectures. These processors will be used by laser printer manufacturers. Besides being incorporated into laser printers, this may result in the Arm chip being adopted as a graphics co-processor in other machine architectures.

The Arm has already been adopted by Radius for its Apple Mac co-processor, but this simply speeds up resident Quickdraw (Mac resident library) routines. An Arm/Trueimage co-processor, on the other hand, could find its way into the PC market, since Trueimage is set to become an OS/2 standard.

According to Rodney Bieira, product manager at Microsoft (US), Bauer Enterprises ported Bauer PDL (predecessor to Trueimage) to the Arm chip some time ago.

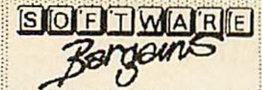
Since then Microsoft has acquired Bauer, and if there is enough demand from users and printer manufacturers, Microsoft will port the remainder of Trueimage.



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2

BBC/ELE CASS RRP £9.95

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(All prices are per age-range)

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- SPELL A WORD:- Enjoy naming the pictures
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6 - 8 YEARS Includes:-

- NUMBER TRAIN:- Calculations made enjoyable
- SHOPPING:- Which shops for which products?
- MATHS MAZE:- Fun improving arithmetical skills
- TREASURE HUNT:- Introduction to co-ordinates
- BOUNCE:- Get to grips with angles
- PACKING:- Discover tesselating shapes
- CATERPILLAR:- Word building challenge
- NUMBER 1 JUMP:- Have fun practising tables

OVER 8 YEARS Includes:-

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- PASSAGE OF GUARDIANS:- Enjoy anagrams
- UNICORN:- First steps in problem solving
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- MYSTERY MACHINE:- Have fun breaking codes
- ESCAPE:- A final check on progress

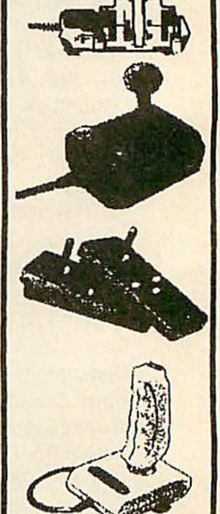
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EXILE	9.95	10.95	15.95
HOSTAGES	6.95	8.50	10.50
LAST NINJA 2	6.95	8.50	10.50
PERPLEXITY	6.95	8.50	10.50
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STAR WARS TRILOGY	-	15.95	-
PLAY IT AGAIN SAM Compilations 1 to 13 (Each):-	6.95	8.50	10.50
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Superior Col 3 (ELE only)	6.95	-	-

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Joysticks for BBC/B+/Master 128 & Electron Plus 1



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£19.95
Arcade quality micro switches, 8 directional control, 2 fire buttons on base

Superpro Auto
£13.95
Arcade quality micro switches, 8 Directional control, triple action auto-fire & suction pads

Delta 3B Twins
£19.95
2 Analogue, light spring action joysticks wired to one plug

Delta 3B Single
£13.95
Analogue, light spring action joystick; can be used as either left or right-handed

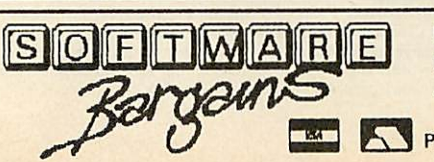
Harrier
£4.95
Fire button on control handle, push bar fire & suction

Panasonic Printers

KX-P1081	£159.95	Includes VAT, standard 1m BBC printer cable & courier despatch
KX-P1180	£169.95	Includes VAT, standard 1m BBC printer cable & courier despatch
KX-P1124	£259.95	Includes VAT, standard 1m BBC printer cable & courier despatch

(Approx 50% Off Archimedes or Master Cpct printer cables; (SSP £18.95) - ie £9.95 in conjuction with this offer)

* Please add 95p P&P (Europe £2.50, Outside Europe £4.50)
* All prices include VAT
* Goods despatched within 48hrs (subject to availability)
* Out of hours answerphone .. 0532 436300
* 30% Discount offer open only until 31st August 1990



Dept AU80, C/O NORTHWOOD HOUSE, NORTH STREET, LEEDS LS7 2AA

Telephone **0532 436300**

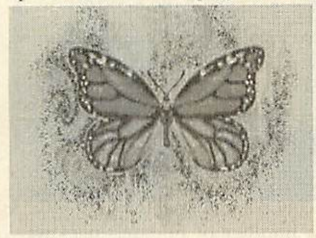
Please make cheques payable to SOFTWARE BARGAINS

SNAPPY SNIPPET

4Mation Educational Resources has released *Snippet*, a screens workshop for the Archimedes.

The package, which costs £34.50, allows screens to be frozen while a program is run. The screen can be saved in whole or in part.

BBC model B/B+/Master screens can be converted into sprites and then re-saved. Both sprites and the display screen can be viewed in a carousel.



Borders and captions can be added to sprites, and colours can be changed within sprites. A pixel editor is also included as is a sprite compressor.

4Mation can be contacted on (0271) 45566.

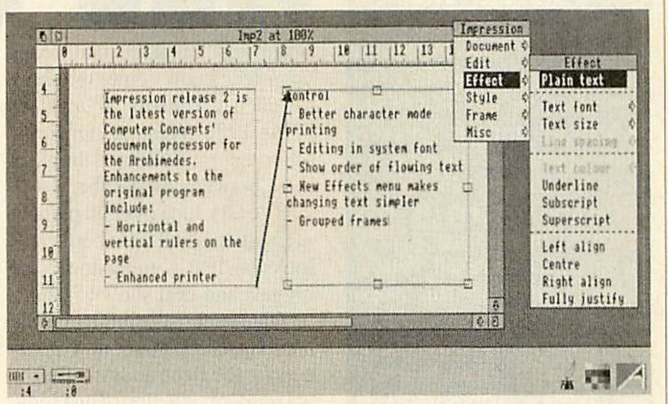
ARC DTP UPDATE

Computer Concepts has released two versions of *Impression*, its DTP system for the Arc.

At £103, *Impression Junior* is aimed at those who wish to use the package as a wordprocessor for the most part, but who would like to create the occasional DTP document.

The package contains features that extend *Impression*'s character mode wordprocessing facilities, and the look and feel of the system is very similar to the current version. The program can be run on 1Mb machines with the spelling checker loaded, and even though it is a cut-down version of *Impression*, it offers additional features including multiple frame selection and grouped frame operation, blinking cursor and a range of character mode operations.

Impression release 2 (£194) is the first major upgrade to *Impression*, and has a range of enhanced features including those found on *Impression Junior*.



A new effects menu allows any portion of text to be altered without having to change style. A show flow option is included and a local embedded ruler effect allows margins to be changed without having to define a style. Loadable frame borders are allowed and rulers can surround the edge of a page.

Up to three template documents can be used at once, and 17 fonts are now included (including a new range equivalent to Palatino), together with new clip-art and utility programs.

A free upgrade is available for registered users. Computer Concepts is on (0442) 63933.

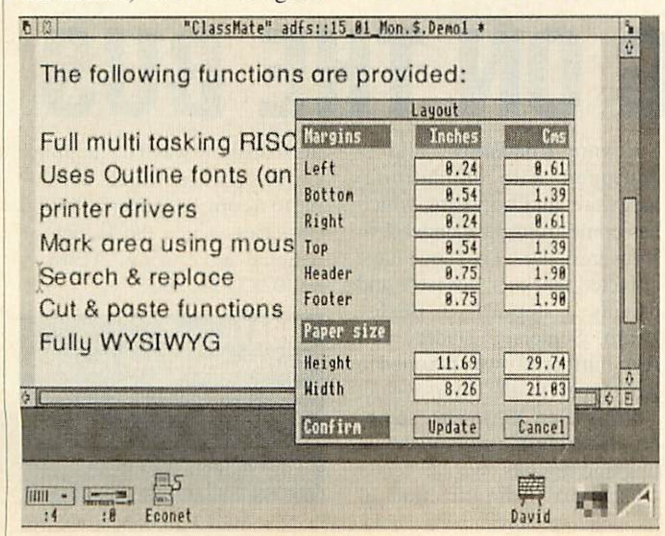
● Beebug is to devote half of its stand at the *BBC Acorn User* show to its long-awaited DTP program *Ovation*. The package costs £115 and a fully functional demonstration version is available at £5, which is refundable if the package is purchased. Beebug is on (0727) 40303.

JUNIOR WORDPROCESSING

Clares has released *Classmate*, an Archimedes wordprocessor for primary and junior schools.

The multi-tasking Risc OS application costs £39 (£80 for site licence) and was designed with the help of Derbyshire Local Education Authority.

Classmate makes use of outline fonts and Risc OS printer drivers but only one font can be used in the active text block.



Menus, which can be configured by the teacher, allow functions to be switched off and password protected.

Classmate allows each child to start up their own version of the program which adds their name to the program icon on the icon bar. They can return to their document by clicking on their name on the menu bar.

● Minerva Software has released a £40 wordprocessing package for the Arc. Called *Easiword* the package allows the user to choose the mode of display, which can be from 30 to 132 characters, and large characters are also supported.

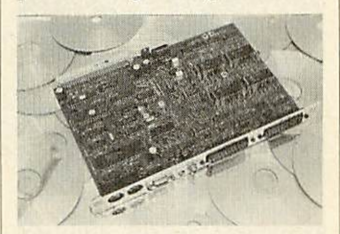
The package provides all the fundamentals of a wordprocessor including embedded commands, and a fun feature for children allows highlights to be in any colour from a palette.

Minerva is on (0392) 437756.

INTERACTIVE A3000 VIDEO

AIP has released a junior version of its interactive video controller for A3000 owners.

The genlock podule and onboard software allow for keying and 50/50 video and computer mixing. A range of effects allows computer or video to be displayed at full brightness, half-toned or mixed.



The system costs £327, supplied with cables, and is suitable for use with a Phillips 400, or similar player.

AIP can be contacted on 091-482 2214.

NEWS IN BRIEF

● The Second Computer Olympiad will take place at Queen Mary & Westfield College, London between August 15 – 21. Potential participants can contact the organisers on 071-624 5551.

● MEU Cymru has developed a pack of Concept Keyboard overlays, disc-based software, floormats and teaching notes with a VHS cassette. To be used with a floor turtle with the Logo language, the pack aims to get teachers started experimenting with getting the most out of using a robot turtle. It costs £20 from Jessop-Ralph Ltd, tel: 081-739 3232.

● STWPD now has over 85 public domain discs. For a catalogue, send an SAE to STWPD, 12 Mornington Rd, Radlett, Herts WD7 7BL.

● Leisure Services' Summer Computer Camp will be held at the Seaburn Centre, Sunderland in August, more details on 091-512 0444.

DIARY DATES

20-22 July. British Music Fair, Olympia, London. Contact: Westland, 071-730 7852. Music software.

7-9 September. BBC Acorn User Show, Westminster Exhibition Centre, London. Contact: Safesell on (0737) 814084.

25-28 September. Business Computing '90, Earls Court, London. Business and trade exhibition only. Contact: Montbuild on 071-486 1951.

6-9 December. Computer Shopper 1990 Show, Wembley Conference Centre, London. Contact: Cape Cowley on 061-480 9811.

20 October. Big Ben Club Open Day, Community Centre De Kiekmure, Tesselschadelaan 1, Harderwijk, Netherlands. Activity groups for education, genealogy and DOS+. Contact: Harry Linsen on (31) 2526-72385 (evenings).

ALL ON SHOW

From the magazine that keeps you in the know comes the show to match it. The *BBC Acorn User* Show 1990, Westminster Exhibition Centre, London is the place to be between September 7 – 9.



By early June over 90 percent of the stands had been booked. It looks as if it's going to be the biggest and best show to date.

The show is going to be the launchpad for many new products for the Beeb and Arc. Below is a random selection of just some of the items on exhibition.

Looking for an Arm3 upgrade? Fear not, Aleph One, Beebug and Watford Electronics will have Arm upgrades for you to choose from.

Atomwide will be selling its 8Mb memory upgrades for the 400 series, and 4Mb memory upgrades for the A3000. There will also be a colour TV modulator for the A3000 and 4Mb memory upgrades for the 300 series from Computerware Research.

Mass storage fans will be glad to hear that Ian Copestake Software will be launching a unique range of disc upgrades for the Archimedes 300 and 400 series. For the first time it will be possible to use up to three external floppy drives with your computer, and even be able to read 40-track discs. ICS will also have the new *Basic Editor* and *Wordpower* for Beeb, Electron and Master owners.

Clares will be making quite an impact at the show. *Tempest*, its DTP package, will feature on its stand at an introductory price of £130 (£150 normal).

It has been designed to run on a 1Mb BBC A3000 or Archimedes 310 without sacrificing any features. *Rhapsody* is a music notation package which allows you to write and modify musical scores, just like a wordprocessor allows you to manipulate text.

Pineapple Software will have a number of updated packages for the Beeb including *PCB Designer*, *Diagram II* and *ADU*.

Finally, a number of practical seminars will be a feature of the show. The whole range of Acorn micros will be covered, and the sessions will include:

- Getting the most out of the *View* and *Wordwise* families
- DTP
- Educational topics
- Networking
- Printers and monitors
- Eight- and 32-bit music
- Computer art
- The future of the Archimedes

Full details will appear in the September *BAU*.

GETTING ON THE BUS

To show the educational potential of the Archimedes, Acorn has been driving a double-decker bus around the country.

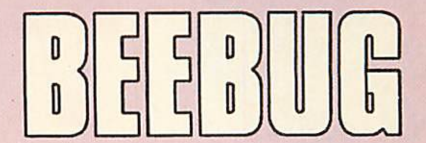
The bus is part of the Acorn Software Roadshow, and is equipped with educational hardware and software which has come from 22 independent software houses. The shows have attracted teachers, advisers and parents at stop-offs in Bexley Heath, Somerset, Dudley and Ayr. Further days are planned in November in the Merseyside, North Wales, Yorkshire, southern Scotland and southeast England regions.



One of the main attractions of the roadshow was The Learning Curve package, which, according to Acorn, has generated 4000 enquiries since the launch of national advertising. Acorn is on (0223) 245200.

ERRATA

The headline for the lead news story in the July issue carried the wrong date. In fact, the new Risc OS will be launched in 1991, not 1990.

BEEBUG The Archimedes Specialist 

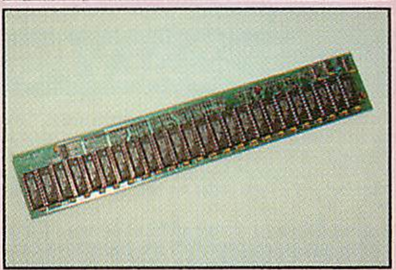
SPECIAL SUMMER PROMOTION

THE A3000 LEARNING CURVE



Acorn's new Learning Curve Package consists of an A3000 computer, First Word Plus V2 (the number one Word Processor package for the Arch), the PC Emulator, Genesis (A graphic based database system with a number of sample files). A parent's guide to the national curriculum and a demonstration video (VHS) is also included.

If you purchase an A3000 or Learning Curve from Beebug in addition to the backup service for which we are renowned, we will supply a free Beebug 1Mb RAM board. This board uses surface mount technology to achieve its remarkably small size of 256x46mm. A special feature of the Beebug upgrade is that it is expandable by the user to 3Mb (giving a total of 4Mb), unlike most other products. We believe that this is the best RAM board available for the A3000.

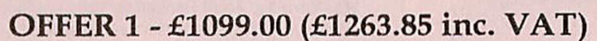


Learning Curve (no monitor)	699.00 (803.85 inc. vat)
Learning Curve (Acorn Monitor)	878.73 (1033.80 inc. vat)
A3000 (no monitor)	585.83 (688.85 inc. vat)
A3000 (Acorn Colour Monitor)	780.98 (918.80 inc. vat)



THE ARCHIMEDES 400/1 SERIES

For a limited period we are offering a number of unbeatable offers on the 400/1 series computer. It is our company policy only to supply what we believe are the best products available for the price. Our upgrades are equivelent or higher in specification to those supplied by Acorn.



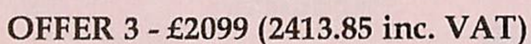
OFFER 1 - £1099.00 (£1263.85 inc. VAT)

An Archimedes 410/1 upgraded with either a high quality 20Mb hard drive or a Star LC-10 Colour printer.

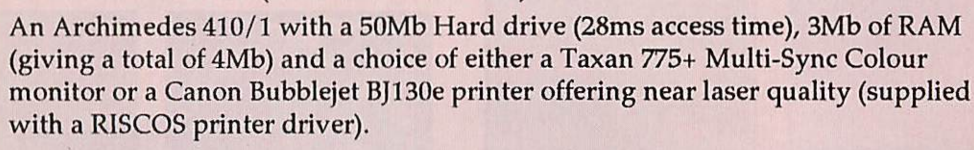


OFFER 2 - £1499.00 (£1723.85 inc. VAT)

An Archimedes 410/1 with a 40Mb fast (28ms) hard drive and either a free Samsung Multi-Sync Colour monitor (RRP £459) or an additional 3Mb of RAM to give the maximum 4Mb of user RAM.



OFFER 3 - £2099 (2413.85 inc. VAT)



An Archimedes 410/1 with a 50Mb Hard drive (28ms access time), 3Mb of RAM (giving a total of 4Mb) and a choice of either a Taxan 775+ Multi-Sync Colour monitor or a Canon Bubblejet BJ130e printer offering near laser quality (supplied with a RISCOS printer driver).



Please add £230 (inc. vat) for an Acorn colour monitor or £459.95 for a Taxan 775+ Colour Multi-Sync if required.

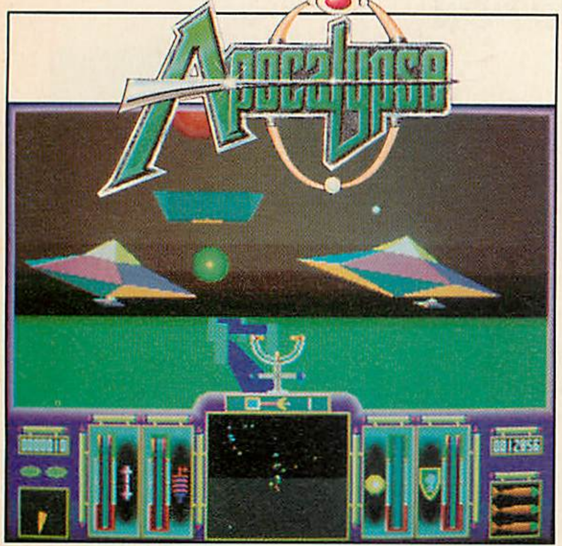
Please *add £8.00 for postage & packaging per system.*

Prices & specification subject to change without notice.

BEEBUG Ltd, 117 Hatfield Road, St Albans, Herts AL1 4JS
Telephone: 0727 40303 (24 hours) Fax: 0727 60263







APOCALYPSE

Apocalypse is designed purely for the Archimedes. Utilising the machine's colossal processing power combined with ingenious programming techniques, the author has created a masterpiece which could not have been produced on any other home computer. The author is of course Gordon Key who already has Holed Out and E-Type under his belt. Apocalypse is by far his best work to date.

The game places you on the surfaces of varied futuristic hostile planets colonised by ruthless enemies. With your highly advanced craft you must find your way around the planets and systematically annihilate the enemy. Your ship, which can fly or move along the ground, is extremely fast and can even fight whilst hurtling backwards.

The graphics are truly unbelievable. The solid, shaded 3 dimensional buildings and objects are animated more quickly and smoothly than ever before. If you shoot at them they explode in a way that is terrifyingly real often catching fire before bursting into a ball of flames accompanied by devastating sound effects.

Initially Apocalypse is easy enough for a beginner to enjoy but as you progress your foes will become increasingly hostile and you will discover fascinating new objects. These can have strange properties and many may need to be destroyed. It will be up to you to discover how.

The Royal Guild of Spacing will monitor your progress as you play. Your performance will be assessed at appropriate times and you will need to impress them if you are to continue your adventure. Apocalypse is an amazing game. There's only one way to describe it....

RAW EXCITEMENT.

PRICE: A3000/Archimedes £29.95



A3000/ARCHIMEDES



A3000/ARCHIMEDES



A3000/ARCHIMEDES



A3000/ARCHIMEDES



INERTIA

Inertia is a totally original game with a huge landscape just waiting to be explored. It is available for the Archimedes, BBC Micro and Acorn Electron. Scattered (or rather fiendishly placed) around the landscape are many special tiles which need to be collected. Your highly sensitive craft floats freely around the landscape and you must exert forces upon it to guide its speed and direction.

You have a 3 dimensional viewpoint displaying a tiny fraction of the total playing area. There are walls, bridges, tunnels and ramps to negotiate and a host of mystery tiles with strange properties indeed. These include ice, jump and transformation tiles. There are even certain tiles which alternate the controls so that everything works in reverse.

This massive game has been very carefully put together and solving the puzzles within it will need lateral thought and a lot of dexterity.

The Archimedes version is considerably enhanced with digitised sound and music. It even features a full colour 3 dimensional map of the game which is a joy just to wander around. You'll certainly be amazed at the size of the game and the variety within it.

Inertia is a game for the determined. Each version makes full use of the ability of the computer so make sure you've got plenty of time to spare. Once you have started you won't be able to stop.

Electron User Golden Game May'90

*BBC Micro and Acorn Electron versions available **NOW**.*
Enhanced Archimedes version available in June, 1990.

PRICE:		
	A3000/ Archimedes	**£19.95**
	BBC B/Master 5 1/4" disc	**£12.95**
	Compact 3 1/2" disc	**£13.95**
	BBC/Electron Cassette	**£9.95**

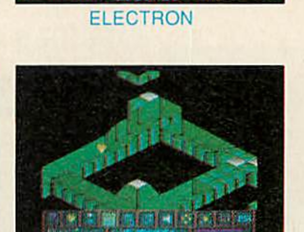


BBC B/MASTER

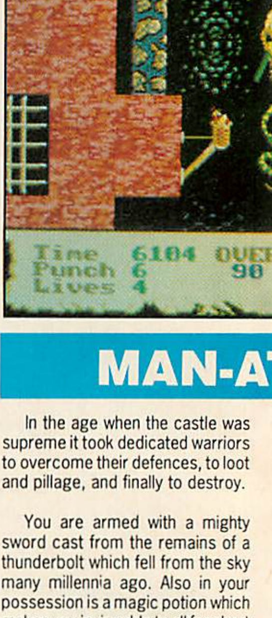
ELECTRON



A3000/ARCHIMEDES



A3000/ARCHIMEDES



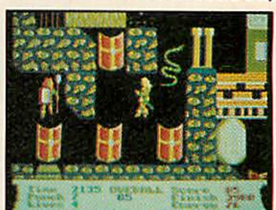
MAN-AT

In the age when the castle was supreme it took dedicated warriors to overcome their defences, to loot and pillage, and finally to destroy.

You are armed with a mighty sword cast from the remains of a thunderbolt which fell from the sky many millennia ago. Also in your possession is a magic potion which makes you invincable to all for short periods of time. Armed with these you must penetrate the inner recesses of 4 castles and do battle with all you find in them.

As you progress you will discover many intriguing objects which can behave very strangely. Many are documented such as wooden panels, hour glasses, thorns, portculli, mirrors etc.. But most are

PRICE: A3000/Ar



A3000/ARCHIMEDES



A3000/ARCHIMEDES

ALSO AVAILABLE	A3000 AND ARCHIMEDES 31/2" DISC	BBC B AND MASTER 51/4" DISC	BBC AND ELECTRON CASSETTE	MASTER COMPACT 31/2" DISC
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Arcade Soccer	19.95	12.95	9.95	13.95
Holed Out (3D Golf)	19.95	14.95	12.95	15.95
Holed Out Extra Courses 1	16.95	11.95	9.95	12.95
Holed Out Extra Courses 2	16.95	11.95	9.95	12.95
Holed Out Designer	19.95	-	-	-

The Fourth Dimension, Dept 4444, 1 Percy Street, Sheffield, S3 8AU. Tel: (0742) 700661 or 769950

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The Fourth Dimension

DIMENSION





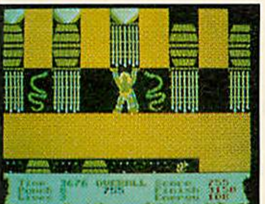
-ARMS

not. When you think your stuck, experiment and you'll discover properties you never knew existed.

The subtle blend of arcade timing and adventurous puzzles make Man-At-Arms fiendishly addictive. You must plunder each of the 4 castles which become increasingly "puzzling" as you progress. Your overall objective is to kill all foes with your mighty sword and to plunder as much of the most valuable treasure as you can carry.

Man-At-Arms is a fascinating challenge with superb sound effects and music. No attention to detail has been spared and you can be sure of many late nights for weeks to come.

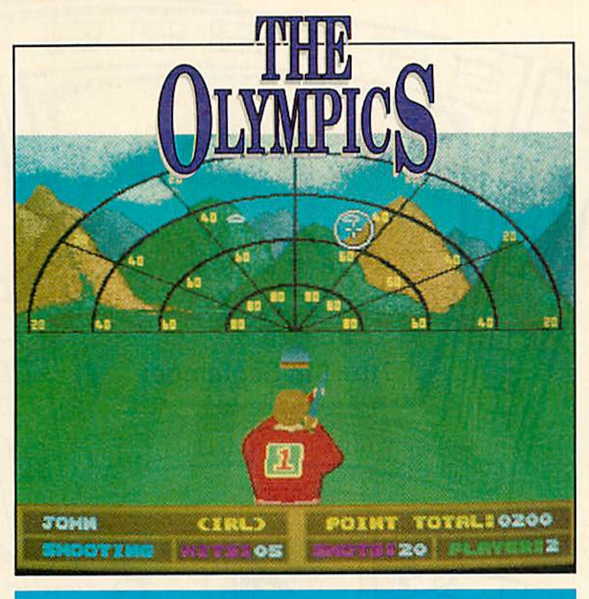
himedes £19.95



A3000/ARCHIMEDES



A3000/ARCHIMEDES



THE OLYMPICS

The Olympics is an experience which can be played by 1 to 8 players. It contains a superb piece of music, opening and closing ceremonies and 14 national anthems. When a player wins a gold medal the national anthem for his chosen country is played. Any World Records that you achieve can be saved to disc. With the click of a button all the relevant information concerning the record is automatically saved including your name, the exact time, day and date!

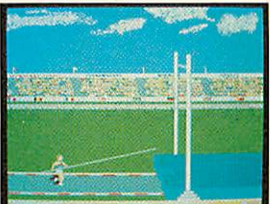
It is comprised of 6 main events: Diving, Shooting, Javelin, Swimming, Canoeing and Pole Vault. Some of these have several "sub-events" to choose from - there are 2 Shooting events, 12 Swimming events and 3 Canoeing events. These events have been chosen for maximum variety and enjoyment. They will "extract" all sorts of abilities: manual dexterity, timing, memory, perserverance, adaptability and above all guts!

The menu systems are controlled entirely with the mouse. As such they are extremely easy and quick to use. All events can be practiced or competed in individually, or altogether for maximum Gold, Silver and Bronze medals. You can also play all 6 events as a sort of "hex-athlon" where points are awarded for each event - the player with the greatest number of points is deemed to be the winner.

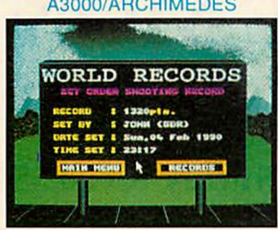
PRICE: A3000/Archimedes £19.95



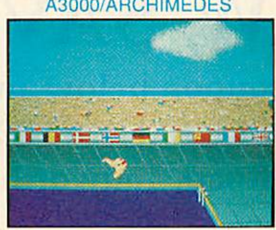
A3000/ARCHIMEDES



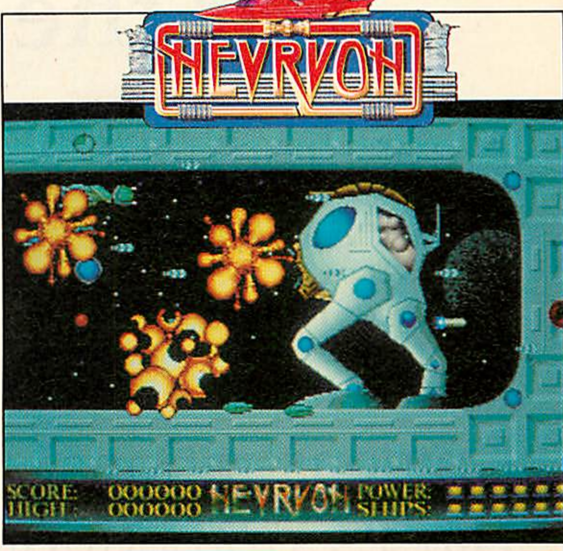
A3000/ARCHIMEDES



A3000/ARCHIMEDES



A3000/ARCHIMEDES



NEVRYON

This fast arcade game is disc based only and boasts 100K of graphics and game code for the BBC and 2 discs of over 1.5 megabytes for the Archimedes. It is a fast sideways scrolling shoot'em up which features 8 levels of furious opponents and very varied and very detailed graphics.

You fly a spaceship which can attain immense firepower - more lasers, a ram, gun droids and highly destructive missiles which are released from the top & bottom of your ship, then ignite and shoot forwards.

Whilst the BBC version is superb, the Archimedes version has been considerably enhanced and is truly exceptional putting many arcade games to shame. Nevryon uses the machine's raw power to full effect and gameplay is second to none.

It comes on 2 discs and features 5 true levels of parallax scrolling, more than 50 objects on screen, over 1 megabyte of 256 colour graphics, digitised stereo sound and music etc. etc.. You control a different ship on each of the 4 scenarios and there are a seemingly infinite number of weapons to collect and use. End of level monsters are beautifully animated but are anything but friendly.

BBC Review: "Graphics are very colourful and hectic, with explosions, missiles and aliens all heading for your ship. Together with a scrolling landscape, complete with stars moving in the background, they combine to form an enjoyable and action packed game." Micronet, Feb'90.

*BBC Micro version available **NOW**.*
Enhanced Archimedes version available in June, 1990.

PRICE:		
	A3000/ Archimedes	£19.95
	BBC B/Master 5 1/4" disc	£14.95
	Compact 3 1/2" disc	£15.95

BBC B/MASTER



BBC B/MASTER



A3000/ARCHIMEDES



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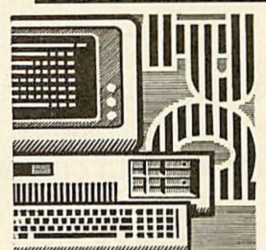
To: The Fourth Dimension, Dept 4444, 1 Percy Street, Sheffield, S3 8AU.

(BLOCK CAPITALS PLEASE)

Name............

Address............

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WHERE IN THE WORLD?

Where in the World is Carmen Sandiego and *Tetris* are two PC games with Soviet connections that have been around for some time now. A year is a long time in computer games but these two programs have matured for longer than that – those unacquainted with them should consider getting to know them now.

Where in the World is Carmen Sandiego is best introduced by describing the scenario you are presented with after typing carmen at the a> prompt:

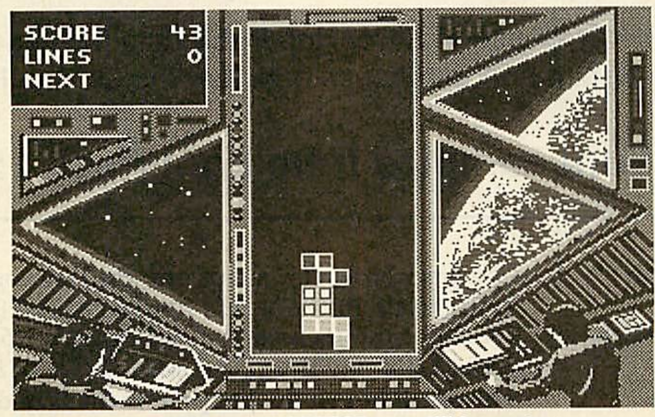
'It is 9am at Police Headquarters and you are asked to identify yourself. Being new, there will be no record of you with Interpol so you'll be assigned rookie status and presented with details of your assignment. This is a tough job: a national treasure has been stolen from the Kremlin and you have until 5 pm on Sunday to track down and apprehend the villain.'

Flashing to the Moscow scene will present you with some general knowledge (irrelevant to the game but still knowledge!) and a menu choice:

```
See connections
Depart by plane
Investigate
Visit Interpol
```

Choosing Investigate will give you a choice of three locations in Moscow and a visit to each will provide information and clues to the identity and likely get-away destination of the criminal. A visit to the Moscow bank will reveal that the clerk there saw a suspicious person changing money into lira and driving off in a limousine. A check with See Connections will list Cairo, Monaco, Reykjavik and Rome as places you can fly to. Get the idea?

Where in the World is essentially an educational game and, while it has an undeniable appeal to people of all ages, the ideal player would be someone between the ages of eight (plus helpful adult) and 14.



Tetris proves that the poor old USSR can still innovate

On the Master 512 the machine's speed does make the game a trifle frustrating for clever grownups but for younger players, less preoccupied with time, the pace is just right. A world almanac comes with the game to help you apply your deductive skills.

Carmen Sandiego is the central character (and thief) in what is now a series of four games that has sold over a million copies. Three of them work on the Master 512, *Where in the World, Where in the USA* and *Where in Europe*. The latest offering, *Where in Time*, comes on three discs and unfortunately is too large for the Master.

My favourite is *Where in the World* but *Where in Europe* is just as good. Europeans may or may not be fascinated by *Where in the USA*. Younger players may find it less satisfying having to work with the Fodor USA travel guide that comes with the game. The little atlas of Europe for the other game seems more fun to me.

The other game, *Tetris*, was written by Alexi Paszitnov of the USSR Academy of Sciences from an original idea by an 18-year old, Vagim Gerasimov.

The rules of the game are elementary: from the top of the screen a block of bricks, in a particular geometric configuration, will descend. Before it reaches the bottom you must move the block left, right and/or rotate it so to ensure smooth placement in a line of a wall being constructed.

A complete line of bricks, meaning there are no gaps between one block and another, will shift down and eventually out of sight and when a sufficient number of lines are complete you move on to another location. This is nowhere near as dull or unimaginative as it might seem. The background graphics are delightful and the mental challenge is addictive.

I have little interest in arcade-style games but *Tetris* is fascinating and ingenious. The f1 key keeps the basic key strokes listed on the screen and the other function keys provide various little extraş.

You can also cheat by pausing with the P key or, if you belong to Mensa, the choice of increasingly difficult levels will tax your brain to bursting.

So play *Where in the World* and help the Russians regain their stolen art treasure. In return the Russians bring you *Tetris*. Who needs the Cold War mentality of point-and-shoot arcade games?

Where in the World and *Tetris* allow you to pit your wits in peace and learn some general knowledge in a fun way.

The *Carmen Sandiego* series and *Tetris* should be available at PC software outlets.

Sean Sheehan

NEWS IN BRIEF

● Some useful items are available from Essential Software, a company whose aim is to provide novel and useful software for the 512.

***Command Line Mouse*, unlike a standard PC mouse driver, works on the command line and it can therefore provide mouse control for programs which normally do not, or cannot, work with a mouse.**

It takes no 512 memory and no configuration is required. The two mouse buttons can be user-assigned but the default is RETURN and ESCAPE. I used it with *Where in the World* (which isn't designed for a mouse) and it worked a treat. The price is £12.95 from Essential Software, PO Box 5, Groby, Leicestershire, LE6 OZB.

● A 512 Mouse Driver, which is a Master version of the standard PC mouse driver MOUSE.COM, is available from Tull Computer Services at 115 Gammons Lane, North Watford, Hertfordshire WD2 5JD. Tel: (0923) 662240, priced £30.

● A puzzling observation: Using Dos+ Version 1.2 will allow the best of *Newsmaster* to run. However, if the latest version of Dos+ is used, Version 2.1, *Newsmaster 2* will not even start to load.

● With the release of Windows 3, Windows is increasingly ascendant over IBM's own Presentation Manager as the dominant user PC interface. Wordprocessor supplier Wordperfect has released a Windows 3 version – apparently due to customer demand – reflecting the trend to Windows.

This is bad news for Beeb users. It shouldn't bother Arc owners as the Arc can, by a software fix, support Windows' EGA graphics standard. But EGA is simply not an available option for the Master.

BEEBUG OUTLINE FONT PACK 1

Beebug Outline Fonts Pack 1 provide a range of high quality outline fonts designed specifically for the Archimedes. Each font contains nearly 200 characters designed to produce the best quality output on the screen and printer.

A new 'prolog' file is supplied allowing the new typefaces to be printed on PostScript compatible printers. They are mapped as follows:

Paladin is a Palatino ® equivalent
SwissB is an Helvetica ® equivalent
SymbolB is a Symbol equivalent
Vogue is an AvantGarde ® equivalent

Beebug Outlne Fonts are ideal for use with Desktop Publishing packages and word processors that use the Acorn Outline Font manager. Please note that the Outline Font Manager is supplied with this pack.

Font samples from Font Pack 1:

Paladin.Roman	The quick brown fox jumps over the lazy dog 1234567890 THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG
Paladin.Roman.Italic	*The quick brown fox jumps over the lazy dog 1234567890* *THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG*
Paladin.Bold	**The quick brown fox jumps over the lazy dog 1234567890** **THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG**
Paladin.Bold.Italic	***The quick brown fox jumps over the lazy dog 1234567890*** ***THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG***
SwissB	The quick brown fox jumps over the lazy dog 1234567890 THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG
SwissB.Oblique	*The quick brown fox jumps over the lazy dog 1234567890* *THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG*
SwissB.Bold	**The quick brown fox jumps over the lazy dog 1234567890** **THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG**
SwissB.Bold.Oblique	***The quick brown fox jumps over the lazy dog 1234567890*** ***THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG***
Vogue.Book	The quick brown fox jumps over the lazy dog 1234567890 THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG
Vogue.Book.Oblique	*The quick brown fox jumps over the lazy dog 1234567890* *THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG*
Vogue.Demi	**The quick brown fox jumps over the lazy dog 1234567890** **THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG**
Vogue.Demi.Oblique	***The quick brown fox jumps over the lazy dog 123456780*** ***THE QUICK BROWN FOX JUMPS OVER THE LAZY DOG***
SymbolB	!#∃%&()*+,−./0123456789:;<=>?≅ΑΒΧΔΕΦΓΗΙϑΚΛΜΝΟΠ ΘΡΣΤΥςΩΞΨΖ[∴]⊥_ αβχδεφγηιφκλμνοπθρστυϖωξψζ{|} ϒ′≤⁄∞♣♦♥♠↔↑→↓×∂•÷≡≈↵ℵℑℜ℘⊗⊕∅∩∪⊃⊇⊄⊂⊆∈∉∇ ®©™∏√−¬∧∨⇔⇐⇑⇓◊〈®©™∑∫

The above fonts are true reproductions of Beebug Outline Fonts.

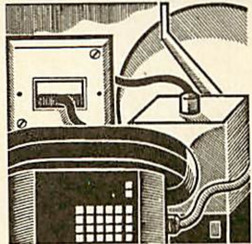
Stock Code 0111B **Price £54.50**

Further font packs (under development):

Font Pack 2 contains Bookman, Courier, Garamond, and Chancery equivalents.
Font Pack 3 contains New Century Schoolbook, Optima, Times and Dingbats equivalents.

All trademarks acknowledged. The fonts in Font Pack 1 are supplied with Ovation DTP.

BEEBUG Limited, 117 Hatfield Road, St. Albans, Herts AL1 4JS.
Telephone: (0727) 40303 *FAX: (0727) 60263*



UK HACKER IN JAIL

Nicholas Whiteley has become the first hacker to be jailed in the UK.

21-year-old Whiteley broke into university computers via the Janet network from his bedroom in North London, causing £25,000 worth of damage to data on a number of systems.

Whiteley has been given a 12 month sentence, four months of which he will serve in jail. But he will not have to pay costs, and his computer equipment will not be confiscated, as requested by the prosecution.

The Whiteley case has caused the on-line community a lot of harm. It will give the proponents of the anti-hacking bill more fuel for their fire, as they and the media in general will tarnish all comms enthusiasts with the same brush.

There's no doubt that what Whiteley did was plain stupid. One might even have cause to doubt his mental stability given that he called himself the mad hacker, and left a number of disturbing messages on the systems he broke into.

The fact is that the vast majority of people who hack into systems do not cause any damage at all, as they get their satisfaction from actually hacking into the system, not altering or deleting any information held on it. But try and tell that to the popular press.

WHITE GOODS
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CREDIT PROVIDERS
SMALL DOMESTIC APPLIANCES
BROWN GOODS
INFOTRAC VIEWSHARE
INFOTRAC EUROPE
INFOTRAC USA
PRIVATE CORPORATE NETWORKS
INFOTRAC FAR EAST
RETAILER
MARKETING INFORMATION - TARGETTED PROMOTIONS
EPOS
PC'S
IPSS
COMPUTER BASED TRAINING

If a picture is worth a thousand words, then could someone please tell me what all this is about? Big cloud, lightning bolts, little clouds with little bolts, it's all too much for me. But wait, the iddy-biddy boxes have text in them, and I think the idea is that the whole lot can be connected via Infotrac Viewshare. If that's right, then brown and white goods can be connected to small domestic appliances which in turn can be connected to IPSS!

THE SPEED OF ARC

Last month I devoted a large section of the comms column to the subject of the serial port on the Archimedes.

I have since done some more digging on the subject (thanks to Lindsay Morrison of Kerridge Data Systems for assistance), and the facts are as follows:

The serial port on the whole of the Archimedes range can only operate at up to 19.2Kbits/sec. In other words the Arc serial port cannot keep up with a V.32/V.42bis modem (which can have an effective throughput of 38.4Kbits/sec).

This is a sad state of affairs, as my bog-standard PC XT compatible can hold its own in this situation. Even the serial port on the ZX Spectrum Interface 1 can achieve 19.2Kbits/sec – and that was available seven years ago!

There are a couple of solutions. Brainsoft does a multipurpose podule which has an RS232 port rated at 38.4Kbits/sec, and Intelligent Interfaces has a dual RS423 interface which operates at the same speed. In fact, the sysop of The World of Cryton uses the latter for fast access to his system.

The question is, if you used one of these cards, would it work with your comms software? To answer that you'd have to question both the software producer and either Brainsoft or Intelligent Interfaces. You wouldn't have much of a problem as you'd probably just have to configure a port number or something similar.

Incidentally, Hugo Fiennes, sysop of The World of Cryton, is currently developing a new version of his comms package *Arcterm*. The new version will be a Risc OS multi-tasking package that will be compatible with the serial podules I mentioned above. More news on that when it happens.

NOW HEAR THIS

It would appear that I used an ambiguous choice of words in the June issue when I seemed to imply that Telecom Gold was the only means available for deaf people to email each other.

Of course *any* email system can be used by the deaf and hard of hearing to communicate with each other.

However, it appears that Telecom Gold offers deaf users a good deal in many respects. A letter from Michael King-Beer, systems manager of the BKU group on Telecom Gold explains this. In part of his letter he says:

'The mailboxes in the XCH and BKU groups are dedicated for use by deaf people and those whose work or circumstances involves them with deaf people. We enjoy a special flat rate concession from Telecom Gold, of £5 per mailbox per month for unlimited use of the system in non prime-time, but we pay the normal prime-time charges.'

David Janda

NEWS IN BRIEF

● Modem Marketing, which manufactures and sells the Demon 4 intelligent multi-speed modem, has got BABT approval for the device.

Not only that, but the company is selling the Demon 4 for 300 quid. For that you get a V.22bis modem with MNP error correction and data compression to level five. This has to be the best deal going. Modem Marketing is on (0733) 371388.

● I have mentioned V.42 and V.42bis standards before.

V.42bis is the internationally agreed 'standard' for data compression on a modem that operates on a public telephone network. Now, if you are thinking of buying a copy of the V.42bis specification, with the hope of implementing it on the modem that you are currently designing. Even though V.42bis is an agreed standard there are a few outfits which lay claim to developing it, and they want a cut – $55,000 worth to be exact.

That's just the sort of money-grabbing attitude that's *not* going to encourage small modem manufacturers to follow suit.

● STOP PRESS! I've just received word that British Telecom is to provide £4 million in an initiative to help deaf people make better use of the phone.

A national relay service for the deaf and hard of hearing, developed and run by the Royal National Institute for the Deaf, will replace the current Telephone Exchange for the Deaf (TED).

The service will allow deaf people to make and receive telephone calls in text format using a terminal. More information next month.

If you have any comms news, please send it to David Janda at BBC Acorn User *or via Telecom Gold on 81:RED001 or Prestel 919992492.*



NEWS IN BRIEF

• ESM has published Numbers in the National Curriculum, a series of packages written by the indefatigable Anita Straker to help schools deliver the National Curriculum for maths.

There are three pieces of software – *Getting Ready for Maths*, *Place Value Activities* and *Number Games*. They all contain six separate programs and are accompanied by instruction manuals with tips for use.

Each package costs £18.50, for the BBC micro.

ESM is particularly prolific at present and also new from the company are *Kaleidoscope* and *Frieze*. Both promote design skills by using the mathematical concepts of rotation, reflection and translation to create simple or complex patterns.

Using *Kaleidoscope*, pupils can investigate shapes and discover the world of pattern. *Frieze* is a progression from *Kaleidoscope* and enables students to produce complex frieze designs.

The programs cost £35, again for the BBC micro, and were developed at Homerton College, Cambridge.

ESM can be contacted at Abbeygate House, East Road, Cambridge CB1 1DB.

• *Freddy Teddy*, a cute little fellow if ever there was one but previously known only to Nimbus users, can now make the acquaintance of A3000 owners. The program is mouse-driven and comes with a resource pack and story book.

Contact Topologika at PO Box 39, Stilton, Peterborough PE7 3RL.

• *Information Technology: A Curriculum Map* by Dave Maddocks and Lesley Lincoln, which was mentioned in the June issue of *BAU*, can be obtained from the Hunter Press, 40 Hylton Road, Newton Hall, Durham DH1 5LS. It costs £9.99.

ACORN AT CD-ROM EUROPE



Music in education is one of the main themes at July's British Music Fair, to be held at Olympia, London on the 20-22 July. Teachers will be on hand in the Learn To Play Centre to provide advice on suitable technology, instruments and courses.

Although the occasion was sponsored by rival Research Machines, Acorn used the education conference at the recent CD-Rom Europe exhibition to give the first public demonstration of multimedia CD-Rom XA running on an Acorn system.

Schools' marketing manager Chris Humphries described CD-Rom as an 'exciting, productive, creative educational tool' and affirmed his belief that schools should have access to interactivity in the classroom.

Chairing the session, Fred Daly of NCET expressed the view that the onus is on hardware manufacturers to ensure that appropriate software is available to schools.

Chris Humphries responded that 'importing solutions from the States is very dangerous' and said that Acorn is involved in discussion on this side of the Atlantic with, among others, Neris and Virgin Publishing.

Also on the platform and arguing their corners were representatives from RM, Apple and Philips and it was both rare and interesting to see the different players in the education field lined up against one another.

AWARDS OPEN

This year's Educational Technology Awards are now open and schools are asked to send details of products – software, hardware, peripherals or anything that comes under the nebulous heading 'educational technology' – which they think deserve an award.

Products must have been launched in the UK in the last year and nominations must be in by 5 October 1990.

If the product your school suggests wins, you will be the lucky recipient of a special invitation to the BETT 1991 exhibition, where the awards will be presented, and a certificate praising your perspicacious judgement.

There are two categories – primary and secondary – and the judges will make gold, silver and bronze awards in both categories. They'll be looking for content, originality, design, adaptability, ease of use, safety and value for money.

Last year's winners were all Acorn-related, showing the company's dominance in the education market. They included the Spacetech Weather Satellite Receiver Podule, Sherston's *Teddy Bears' Picnic* and *Touch Explorer Plus* from the NCET.

So, if you have a pet piece of new technology, list its name, the company which produces it, which category you are submitting it for and your name and address on a piece of paper. If you wish, add a couple of lines about why you think the product is worthy of an Educational Technology Award.

Send nominations to Educational Technology Awards, *Educational Computing and Technology*, 20-26 Brunswick Place, London N1 6DJ.

The scheme is sponsored by *BAU*'s stablemate *Educational Computing and Technology*, the British Educational Equipment Assocation and EMAP, organisers of the BETT show.

BETT 1991 takes place at the Barbican in London from 16 to 19 January so make sure you put a note in your diaries. If you want to register for tickets now, contact BETT 1991, EMAP Exhibitions, 12 Bedford Row, London WC1R 4DU.

ITED '90 CONFERENCE

ITED '90 is the rather unprepossessing name of a national conference with the commendable aim of focusing on the work of IT co-ordinators, particularly those in secondary schools.

As well as discussing the broad implications of the new technology curriculum, delegates will have the opportunity to examine, through presentations and workshops, existing practice in a wide range of subject areas.

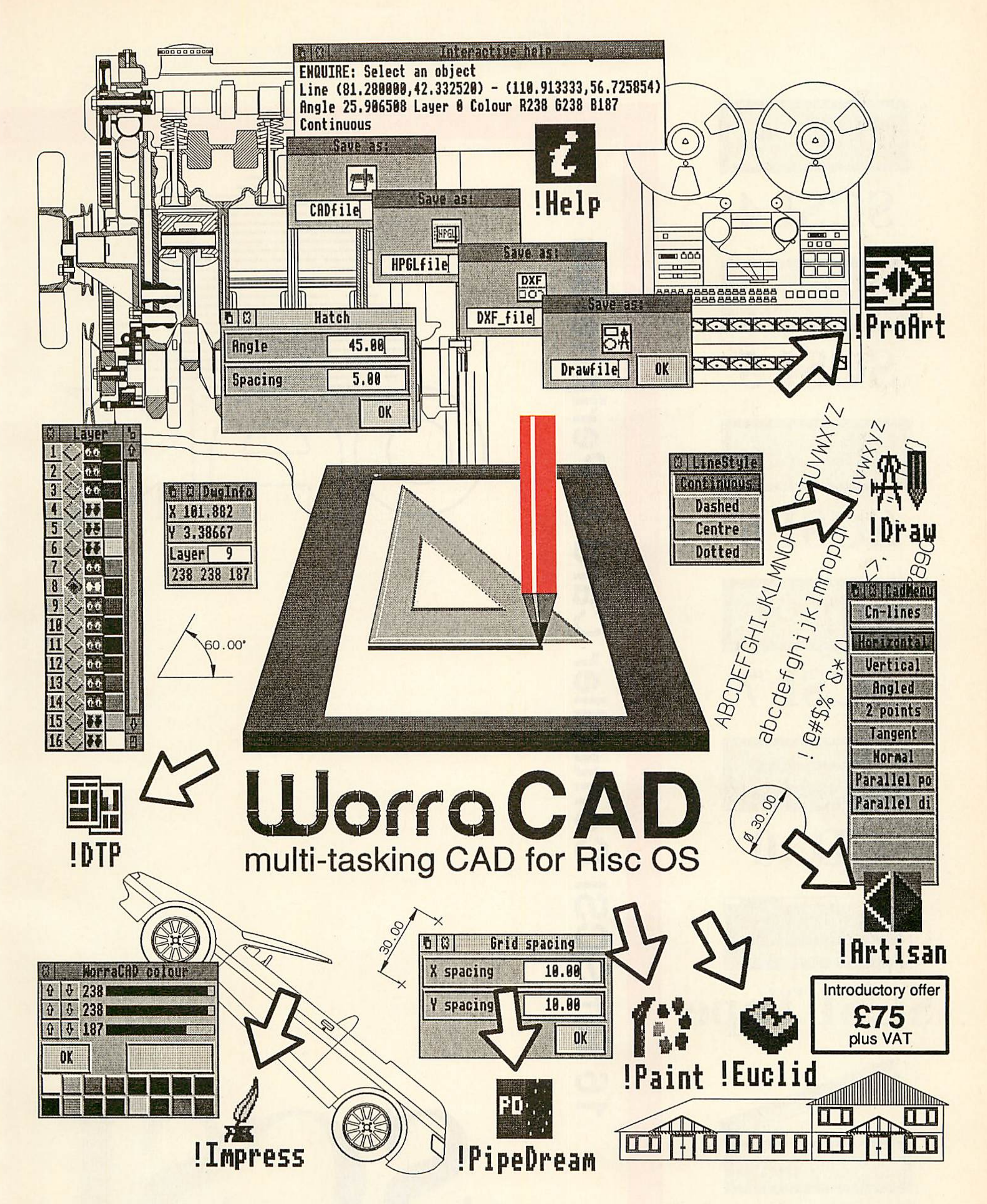
The idea is that this will encourage and equip them to support specialist subject teachers in their own schools.

A hardware and software exhibition will run alongside the conference and there will be an opportunity for delegates and suppliers to discuss resources for the National Curriculum.

ITED '90 takes place at Newman College, Birmingham on 17 and 18 September. The fee is £105 residential or £85 non-residential.

For more information contact LTS, Haydon House, Alcester Road, Studley, Warwickshire B80 7AN.

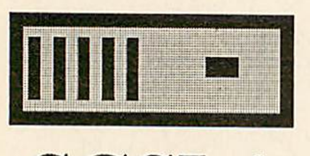
Lisa Hughes



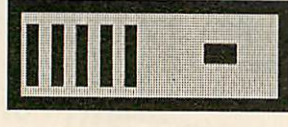
Draw your own conclusions!

ALL WorraCAD drawings on this page were produced on a 1mb A3000

For further information contact your authorised Oak dealer or contact Oak direct at Cross Park House Low Green Rawdon Leeds LS19 6HA Tel: 0532 502615 Fax: 0532 506868



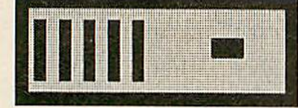
SCSI 4



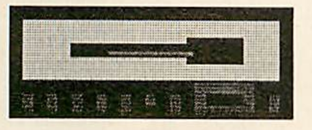
SCSI 5



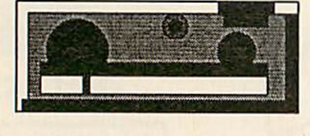
SCSI 6



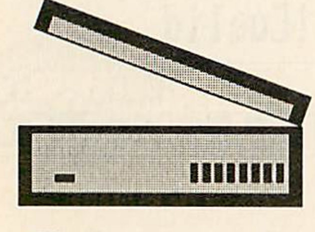
SCSI 7



CD :0



SCSI Tape



Scanner





SCSI

Protect your data with our good name

Oak is one of the largest software and hardware companies operating exclusively in the Acorn market, and is market leader in SCSI.

Our manufacturing division specialises in producing high speed SCSI interfaces and storage devices for the Archimedes 300, 400 and A3000 range of computers. The interfaces provide a filing system 'SCSIFS' which is totally compatible with Acorn's SCSIFS, and works in the same way as ADFS.

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SHOW TIME



Yes, it's that time of year again. From 7-9 September all roads will lead to the Westminster Exhibition Centre for the *BBC Acorn User* Show.

Next month we will have the lowdown on who will be there, what they will be showing and all the other reasons for making sure you don't miss the Acorn event of the year.

Plus you can't miss our super prize-packed competition for all visitors.

And that's not all. The September issue is packed with exciting reviews and features. There's a powerful ray tracing program for the Beeb and Arc, and a program to help you manipulate *!Draw* files. Plus more image analysis and Arm secrets.

On the review front, there's an update on what's new in the world of laser printers, add-ons for your A3000, an upgrade for your Master 512 and a look at some books you can read on your way to the show.

In education there's a look at special needs software and the regular column – plus how to get the entire planet inside a Beeb. It all keeps you at the head of your class.

All this and our regular items – Risc Revue, Eight Bits, Game Show, News, End User – go to SHOW that *BBC Acorn User* is the best magazine ever.

DON'T MISS THE SEPTEMBER ISSUE – OUT 12TH AUGUST



PRINTER ERROR

Your technical advice is usually very good but in reply to a letter in Questions and Answers June 1990 you told a Mannesmann Tally MT80+ owner that: 'I'm afraid your printer cannot cope with the text and graphics mode that the Risc OS printer drivers can.'

Your correspondent was quite mistaken. I had the same problem with my old Star DP510, when I bought an A3000 at last year's *BBC Acorn User* show I found that none of the printer drivers worked properly. Since then I have solved my problem.

The PRdata file in !PrinterDM contains all of the configuration status and settings for various printers. If you load PRdata into *!Edit* you can change these settings to match almost any printer.

S Bennet
Weymouth

TO BE OR NOT TO BE

I have been reading your magazine regularly for some months now, ever since you reviewed the BBC A3000 in June 1989 and I would like to ask this question, is the A3000 an Archimedes or not?

At first this question may seem stupid as the A3000 uses the same Basic, chips and mouse as an Archimedes, but it is often referred to as distinct from the Arc in your magazine. I can understand this if the article or advert is to do with hardware but surely this should not be the case with software.

R S Atkins
Essex

You're right, of course. An A3000, although physically different to an Archimedes, is completely compatible when it comes to software. The machine is referred to separately merely to emphasise that this is the case. Of course when it comes to hardware things are a little different.


An Arc or not an Arc?

8 BIT DOMAIN

The article 'Cheap and Cheerful' in the June 1990 issue of *BAU* prompted me to write to you regarding public domain software. It seems strange that there are no similar resources for BBC and Electron owners.

Possibly like many other BBC micro owners I have written a number of programs which I would have been very willing to contribute to a general BBC micro/Electron PD library but until now have been unable to.

Perhaps this would be a good time to set up a library of 8-bit PD software. To start such a library I would like to hear from anyone who has programs which they would be willing to put into the public domain, or anyone who supports the idea.


It's showtime at BAU

Assuming that the library gets going everyone who writes in (with an SAE) will receive the first library list when I have compiled it. Could I ask readers who have programs to contribute to enclose a disc containing their submissions together with return postage. Each disc will be returned, hopefully full of other contributions.

Alan Blundell
BBC PD
18 Carlton Close
Blackrod
Bolton BL6 5DL

OK, all you BBC and Elk owners, it's over to you.

RISCING IT

Recently I got involved in a conversation with our computer engineer. After 45 minutes we both agreed that Risc OS was probably the best operating system yet to be invented.

In Risc OS we have the definitive operating system which, although it demands conformity, allows a basis for all programs to work from and gives the user an unprecedented amount of control. I am dyslexic and as such have two basic needs.

1) To organise myself and my thoughts clearly.

2) Present those ideas to others in an understandable form.

It is easy to see that any computer can help but it would be handy if all these things worked together, so enter Risc OS.

I am currently using *Timewatch* from Mitre Software, *Home Accounts* from Minerva and *First Word Plus*, which multi-task under Risc OS happily and without any problems.

The other piece of software I would like is a text organiser or similar 'free form' database, very similar to Clares' *Knowledge Organiser*, but one that runs under Risc OS. What is the point of having something as useful as the desktop and not using it? As one computer journalist has said: What's the point of re-inventing the wheel, or Wimp in this case?

Finally, a plea to all Archimedes software writers: please can all future releases be written using the multi-tasking and data passing features of Risc OS? Personally I always check to see if a piece of software does multi-task before purchasing it.

Michael Sanders
London

AND FINALLY...

I am organising a trip to the *BBC Acorn User* show. The tickets should cost no more than £16.50 and this includes the entrance fee.

Leaving Plymouth at 5:00am Saturday morning, we should arrive by 10:00am. The show closes at 6:00pm, so we should arrive home around 11:00pm.

The coach is a 49-seater luxury executive, and only one stop will be made at Exeter.

Anyone interested please contact:

David Heath
26 Luxmore Close
Leigham
Plymouth
Devon PL6 8NX

 A selection of problems from our Post A Problem service



QUESTIONS AND ANSWERS

Q A friend of mine said the Atari ST is the best computer to go for when it comes to music. Would you agree? I've always been a Beeb fan and would like to really try an Archimedes or A3000 for this kind of application.

A The Atari ST is well established in the music field and there are some very good music packages around.

However EMR's *Studio 24 Plus* which costs £99 really does show what a 32-bit Risc computer can do. It won the coveted *BBC Acorn User* 'Best Music Software Award 1990'.

It is a full MIDI sequencer package for use with any MIDI instrument or expander module and an Archimedes MIDI interface podule. 24 tracks are provided and MIDI data can be entered via the editor or external keyboard, manipulated and played back any number of tracks at a time.

Pandora will shortly release *Inspiration* – another professional quality MIDI sequencer for the Arc.

EMR is at 14 Mount Close, Wickford, Essex, SS11 8HG

Q Can you explain what a printer's DIP switches do? Could you tell me where they are and how I set them?

A The dip switches normally control features of the printer like:

- column length – 80 or 132 characters
- auto line feed on or off
- form length – 11 or 12 inch
- skip over perforation on or off
- comms protocols used by the printer
- zero font – 0 slash or without
- paper end detector – selects or deselects
- input buffer – data sent by the computer is stored prior to printing
- print mode at power on – it could be normal or emphasised

Usually two or three additional DIP switches select the international character set.

On older printers the DIP switches are often 'hidden away' right inside the printer case. On newer printers they are more accessible. They can be located in a small compartment at the side of the printer or in a cavity under the printer head.

Without the right manual for the printer you will have to spend a lot of time working out and recording what effect each change of position makes to a sample printout.

Q I would like to use a mouse with my BBC Micro. What is available and which would you recommend?

A There are three main suppliers of mice for the BBC Micro – AMS, Watford Electronics and Nidd Valley. They are all of acceptable quality and are all recommended.

I think you will probably find the 'Quest Mouse' from Watford the best, especially when coupled with the company's *Quest Art* package.

A ROM has to be fitted inside your BBC Micro into one of the sideways ROM slots and the mouse is then attached to the User Port.

Q I want to save screens created with *Presenter* and transfer them into *First Word Plus*. Can you offer any help and suggestions?

A When using *Presenter* for creating graphs, use the Save Scr option which allows the current graph to be saved as a sprite which can be used with other programs like *First Word Plus* Save Scr allows the screen to be saved as a Mode 12 sprite.

If you squash the window using the adjust window size icon (bottom right) then only the part of the chart visible in the window will be saved.

For graphs to be used with *First Word Plus* it is important that only about three quarters of the width of the screen is used for drawing. The margins must be set appropriately. If this is not done the right hand part of the graph may be lost when printing from *First Word Plus*.

When you are ready to load a picture into *First Word Plus* you must have the Graphics mode switched on before using the Read picture command. When Graphics mode is on, it has a tick by it.

When you select the Read picture command a dialogue box is displayed. Use the dialogue box in the same way as the Open File dialogue box, to select a picture. Select OK to paste the picture into your text at the current cursor position.

Q I am having problems using my Archimedes 310M which I bought in October 1988. When using the *PC Emulator* certain programs are 'hanging up'. Have you

If you have a problem with an Acorn micro, commercial software or a program you are trying to write then BBC Acorn User can help. The Post A Problem service guarentees to give you a personal answer within 10 working days for just £4.

Write out you problem with as much detail as possible and, if a program is involved, include a disc or cassette. Fill in the coupon at the bottom of this page and send it and your problem along with a cheque or postal order for £4 (including VAT) made out to Redwood Publishing. If you want recorded delivery add on the cost of this.

Please note that debugging readers' own programs or those from other magazines is a complex task and we cannot guarentee to give a full solution. Unless the problem can be spotted quickly, the Post A Problem service will only be able to make general comments. The service will answer the problem and return all material received within 10 working days of receipt. If we fail to match this promise then your cheque or postal order will be returned – you can't lose!

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Peter Dunn fills you in on what's new for the Acorn customer

any idea why this happens?

A The problems you are experiencing using the *PC Emulator* could be due to either you using an early version, or trying to run software that is not compatible with the Archimedes when running in this mode.

See the Acorn Customer Hotline for details of how to get a list of compatible software.

I suggest you return your *Emulator* to Acorn (by registered post) and ask for an upgrade to the latest version which can be run direct from the Risc OS desktop. This is version 1.33 and I think it may solve many of your problems.

Q Can you give me any further information about what the *SAVE and *LOAD commands are for on the BBC Master 128? Can you also give me details of the syntax of these commands?

A The *SAVE command is used to transfer a block of memory to a file. The parameters of the *SAVE command are as follows:

```
*SAVE <fsp> <start address>
<end address | length> (<optional execution address>)
(<optional reload address>)
```

as in...

```
*SAVE File3 FFFF0E00 +100
FFFF0E01
```

...which would save a 256-byte block of memory from &E00 to &EFF.

The memory to transfer can be defined by start and end addresses, or by start plus length. The third optional parameter is the execution address. If not given, this defaults to the start address. The fourth optional parameter is the reload address. If not given, this too defaults to the start address.

The *LOAD command transfers a file directly into memory.

```
*LOAD <filename> <address>
```

The optional address is 32 bits in length, and thus the loading can be directed into the I/O processor or second processor if you have a Tube system. The address is the start point to where the file will be loaded. If the address is left out the file will be loaded to the load address used when you saved it.

Q I have not been able to exploit the colour option of my Star LC10 dot matrix printer which I use with my Archimedes 410/1 computer. Acorn seems to only be providing a Risc OS driver for the Integrex but that is a ink jet printer and of no use at all. Is there going to be a 9-pin dot matrix colour Acorn Risc OS Printer driver?

A At present very few companies have begun to provide support for owners of dot matrix colour ribbon printers. But you are in luck as far as the LC-10 is concerned, as Dabhand Computing of 5 Victoria Lane, Whitefield, Manchester, M25 6AL has released an LC10 Colour Printer Sprite Dump costing £26.04

Q I'm looking for a program to help me with calculating my income tax. I remember that some software was published years ago for the BBC Micro. I've now got an A3000 so is there a similar package for this machine?

A You are right. For many years the Consumer Association has marketed a program called TaxCalc. The association now seems to have deserted the Acorn market and is only producing an IBM version.

However, you will probably be able to run this without any problems with the Acorn *PC Emulator*.

Q My BBC Model B, which has a Solidisk 4Meg RAM/ROM board fitted, won't work properly with Computer Concepts' *SpellMaster* fitted.

A There are known to be problems with certain non-standard equipment when used with Computer Concepts Roms that are larger than the normal 16K. Versions of the Solidisk DFS and ADFS do prevent *SpellMaster* working unless it is in a lower priority socket. This is probably the problem that you are experiencing.

ACORN CUSTOMER HOTLINE

Acorn's Support Information Database (SID) has continued to rapidly expand. The number of registered SID users has now reached almost 2000, and the amount of software that is available for downloading increases weekly. The software includes disc, programming and desktop utilities plus games and demonstration software.

SID can also provide a whole host of information for users of the BBC B/B+, Master 128, Master Compact, Archimedes and BBC A3000 computers. Any user who has a modem can log onto SID via Prestel and download the software/information. Users who do not have a modem can request their local SID-registered Acorn dealer to download the software/information they require. However please note there may be a small charge incurred by the dealer for this service. Unfortunately Acorn is unable to supply software directly from the Customer Services department.

● The Acorn *PC Emulator* package provides an emulation of a 4.77MHz 8088-based IBM PC in the Archimedes. We have often received requests for information concerning the programs available that will run under the *PC Emulator*. Some readers may remember that we requested your help in producing a compatibility list based on your experiences with the emulator. However, we are now able to supply a comprehensive list of software (including in the majority of cases version numbers) that work under the by kind permission of John Eden and *Archive* magazine. The list can be obtained from SID or by sending an A4 SAE to Acorn's Customer Services department.

● Also on the subject of the PC Emulator, users new to the MS DOS environment may want to make a working backup of their MS DOS disc before proceeding further. This is easily done once the machine is running under the emulator. With your MS DOS disc in drive 0 type the command diskcopy A: B: followed by Return. MS DOS will pretend that your computer has two floppy drives if this is not the case, and keep track of the discs for you. The computer will prompt you for the source disc which is already in the drive, so just hit the Space bar. When prompted for the target disc, you can use a previously unformatted disc which will be formatted while copying.

● Customer Services still receives a number of enquiries from Model B owners who are having problems running a particular piece of software. In the majority of cases the problem is caused by old versions of either the Basic chip or the operating system chip being fitted. We would recommend that users check that they are using the latest versions. The version of Basic can be found by typing REPORT immediately after typing *BASIC . The computer will report a copyright message and date. If the BBC reports a date of 1981 then the computer is fitted with Basic I and if it reports 1982 it is fitted with Basic II. To find out the version of the operating system you should type *FX0. The BBC will report 1.20 if you have the latest version. Basic II and OS 1.20 can both be purchased from an Acorn authorised dealer.

● We often receive questions from users of Archimedes 310 and 440 machines who are experiencing difficulties in using the Integrex 132 colour printer. The symptoms are typically lost lines and spurious characters. This problem will affect 310s whose serial number is less than 27 AKB15-10017351 and 440s with serial numbers less than 27 AKB20-10002253. Any approved Acorn Service centre or Acorn Authorised Dealer can perform a simple and free modification to cure the problem.



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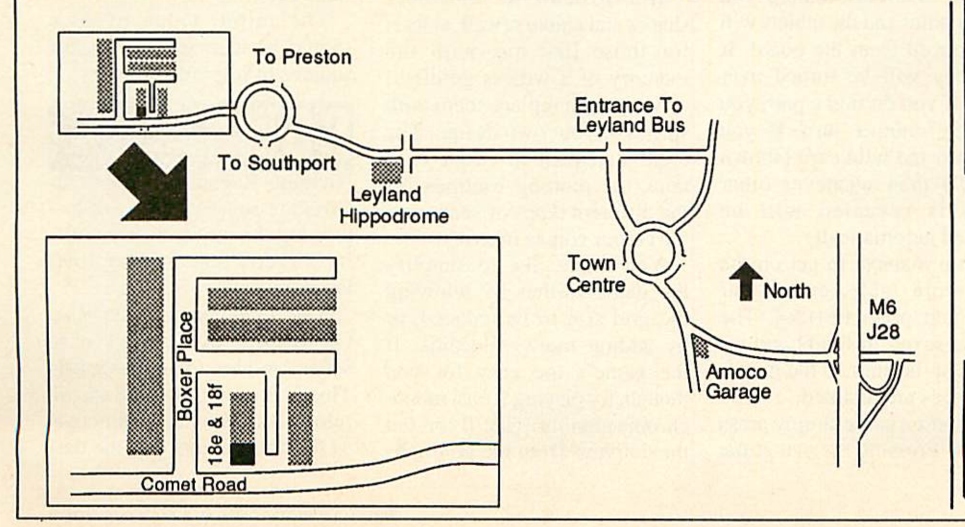
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HINTS & TIPS



For all Archimedes and A3000 owners, DAVE ACTON has compiled

RISC REVUE

£25 MATCH PLAY

Now the glorious British summer has arrived, what could be better than a nice game to persuade you to forsake any plans of a suntan and stay indoors with your Archie.

It's an Arc version of a classic from Robert Taylor of Skegness and is called simply *Pairs*.

The object is to reveal pictures in pairs – the trick is remembering which pictures you have seen and where.

To enter the game, first create a directory called '!Pairs'. Then type in listing 1 on the yellow pages and save this in !Pairs as 'RunImage'.

Now, using *Edit* or similar, create an obey file in !Pairs called '!Run' which has the following two lines:

```
SET Pipe$Dir <Obey$Dir>
RUN <Pipe$Dir>.RunImage
```

If you create this as a text file, remember to set the filetype to obey with:

```
*SETTYPE !Run Obey
```

Finally, you will need to initialise the high score table which is saved as a file in !Pairs. Go into !Pairs and enter the following as a Basic program:

```
c=OPENOUT "High"
FOR n=1 TO 20
PRINT# c,""
NEXT
CLOSE# c
```

You can add on '!sprites' file with a sprite called 'pairs' too if you want. Now you are ready to play the game – simply click on !Pairs from the desktop.

Select the skill level required by clicking on one of the five skill level buttons. Then click on START. Now choose the type of game – one player versus the computer, two player or demo.

In the demo game, the computer plays itself. If playing against the computer, choose if you want to go first or second by clicking on the button shown.

The main play area consists of 49 tablets, beneath which are hidden symbols. The scores for the two players are shown on either side of the main grid. There are 24 pairs of matching pictures and a single 'wild card'. To make a move, click on a tablet and then on another.

If the symbols match, you score a point and the tablets will be removed from the board. If not, they will be turned over again. If you do find a pair, you can take another turn. If you turn over the wild card (shown as '??') then whatever other tablet is revealed will be matched automatically.

If you manage to get on the high score table, enter your name and press RETURN. The table is saved in !Pairs and reloaded at the start so the names and scores are retained.

To abort a game simply press ESCAPE. Pressing ESCAPE at the high score table will return you to the desktop.

You might like to try and improve on Robert's original.

It's difficult to remember shapes and colours (well, at least for those like me, with the memory of a witless goldfish) so you might replace them with sprites of your own design. The CASE statement in PROCc contains the plotting routines for the different types of shape and the colour comes in as d.

You might like to simplify the game further by allowing the grid size to be reduced, or by adding more wildcards. If the game's too easy for you though, try playing it on a monochrome monitor. That'll sort out the dolphins from the goldfish.

Pairs: memory is the key to success

£10 ROOT OF THE PROBLEM

Maurice Hendrix of the Netherlands read our piece 'Rapid Roots' in the February 1990 Risc Revue and points out that it's often useful to calculate the full floating point value of a root in machine code.

Fortunately, as Maurice points out, the routines used by Basic itself are available and he demonstrates how it's done with listing 2 on the yellow pages.

When you CALL a routine in Basic, register R14 contains the return address. Several very handy routines can be found at fixed offsets to this address. The three used by listing 2 are FSTA (at offset &58), FLDA (at offset &5C) and FSQRT (at offset &78).

In listing 2, the number to be square-rooted is stored in the five bytes at square using the | operator (like ! but for floating point values).

The Arm code routine points register R9 to these five bytes and, by shuffling R14 and the PC about, branches to FLDA which takes the five bytes and puts them in R0 to R3.

Next, FSQRT is called to perform the square root and finally FSTA is used to put the answer in the five bytes at root.

To compare results, also included is a Basic version of the Newton-Raphson root-finding process. The result of this (guess) is printed along with that of the code and that of the Basic SQR (which is calculated using the same routine).

The initial value of guess should be increased for higher squares to improve accuracy.

£5 MODE TO MEASURE

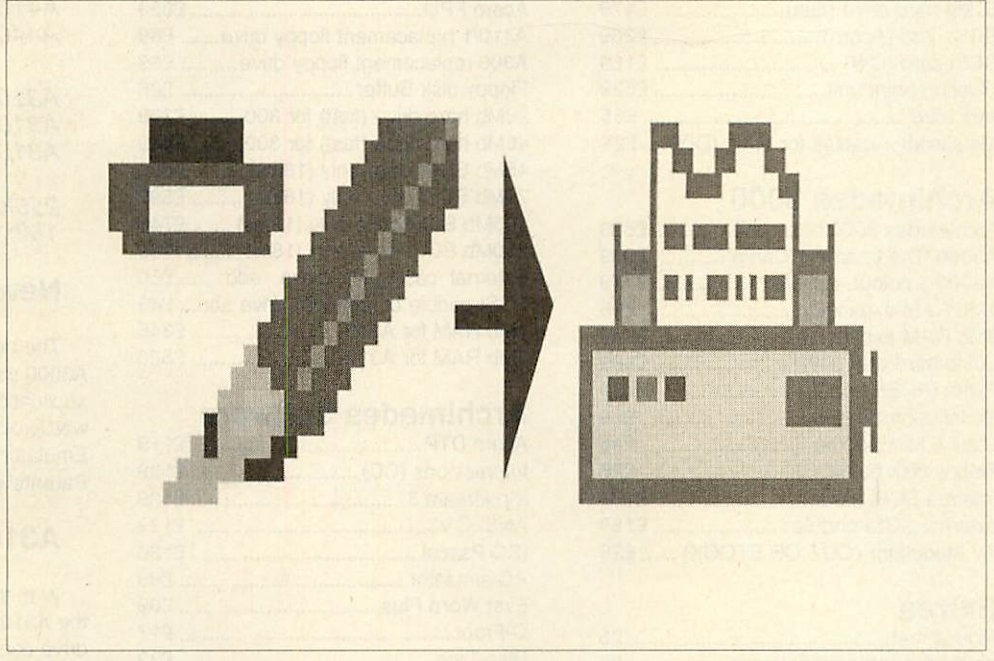
Nicholas Regan of Madeley in Cheshire suggests a way of improving the mode creation utility we carried in the May 1990 issue (page 64).

This demonstrated the Risc OS feature that allows new screen modes to be designed. This is done through the use of relocatable modules, although as Nicholas points out, the list-

ing given only permitted one new mode to be available at any one time.

Load listing 4 from the original article and add/replace the lines given in listing 3 on this month's yellow pages. Resave the program. The number of the new mode is now in the module's title so more than one module can be loaded at once.

Nicholas has two extra desktop modes defined on his system – each with 86 columns and 33 rows. These he calls 112 and 115 which directly replace the standard modes 12 and 15.



£5 MULTISTORE HINTS

K R Cox of Halifax uses Minerva's *Multistore* in conjunction with *First Word Plus* and the *Acorn DTP* system to produce school achievement records and has come up with a couple of tips for other *Multistore* users.

Firstly, when creating paged reports in the form of text files, find the Paged Report:Page Layout dialogue box (page 119 of the manual) and turn off 'Eject After'. Otherwise, *First Word Plus* will not recognise the file as a text file.

Secondly, also regarding paged reports, there is an embedded command [1b]![00] at the beginning of the text file which causes the loss of the heading and an unusual font display. The command should be deleted using *Edit* and the file resaved.

£5 EDIT TIP

Jonathan Baldwin of Malton in North Yorkshire offers a handy way to improve the facilities offered by *!Edit* – the text editor supplied with Risc OS.

Jonathan wanted a means of easily incorporating printer control codes into his text. This he does simply by creating a file containing the required bytes, for example:

```
c=OPENOUT "UnderLn_On"
BPUT# c,27
BPUT# c,45
BPUT# c,1
CLOSE# c
```

Just build similar files for all the highlights and special effects required and put them all in a directory. Then, when editing your text, have that directory handy on the screen. To include a highlight position the caret at the desired place and drag the appropriate file onto the *Edit* window.

£5 CUNNING DEVICES

Tim Gladding of Ely gets a fiver for an interesting little tip on device drivers.

As you may know, system devices can be referred to like filing systems – by their name followed by a colon. Just as you might copy a file from one directory to another with:

```
*COPY adfs::0.$.Myfile
adfs::4.$.NewName
```

You can also print out a file by 'copying' it, like this:

```
*COPY adfs::0.$.Myfile
printer:
```

Tim realised the potential of this when running out of memory in the desktop.

Rather than install the !PrinterDM application (which takes up a minimum of 72K of Ram) he wrote a simple application that just used a *COPY like the one above. This still needed 32K though, so an even more concise solution was needed. The answer lay in the *Filer_OpenDir command.

This is used to instruct the Filer to open a viewer for a particular directory.

It's a very handy command and we've seen it used in *BAU* on several occasions before.

Tim discovered that *Filer_Opendir doesn't really mind what sort of directory name you give it and that, you can even open a viewer for a device driver. For the printer, press F12 and enter the command:

```
*Filer_OpenDir printer:
```

A window appears and, hey presto, any files dragged onto it will be sent to the printer! There are several device drivers that are suitable:

vdu: and rawvdu:	the screen
serial:	the serial port
netprint:	the network printer driver
null:	a null device which 'swallows' all output

Try opening viewers for these. Incidentally, the difference between vdu: and rawvdu: is that characters sent to the former are first filtered according to the configuration of DumpFormat. The difference becomes apparent when you try dragging files with control codes onto a rawvdu: viewer!

DO YOUR BIT...

Send your programs, ideas, hints and tips to: Risc Revue, *BBC Acorn User*, Redwood Publishing, 20-26 Brunswick Place, London N1 6DJ.

I've had a couple of enquiries about submitting items to Risc Revue using Interspan – SJ Research's overnight electronic mail system.

If you can submit pieces in this way I can respond a good deal quicker.

Remember to ask for a delivery report so you can be sure I've received your submission.

As this applies to a minority of readers, you can send them directly to me, David Acton.

BAU STYLE

Just a quick word on a couple of points of style.

We prefer, wherever possible, for Basic variables to be in lower case. This makes for tidier listings and is consistent with the rest of the magazine.

Also, assembler listings should contain few (if any) comments.

We prefer to describe how the program works in the text and for labels to be descriptive.

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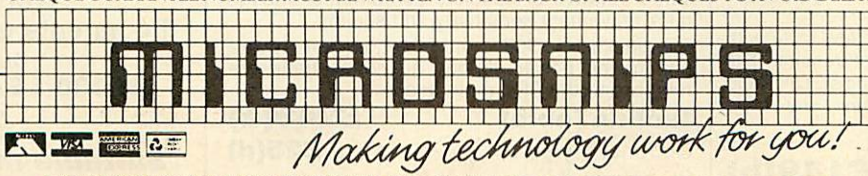
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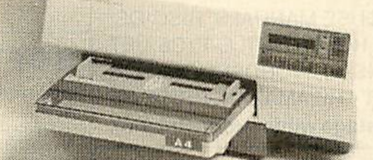
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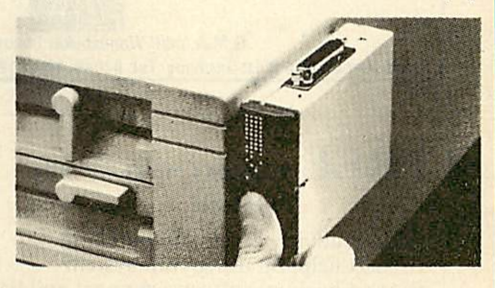
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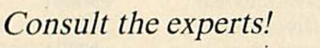


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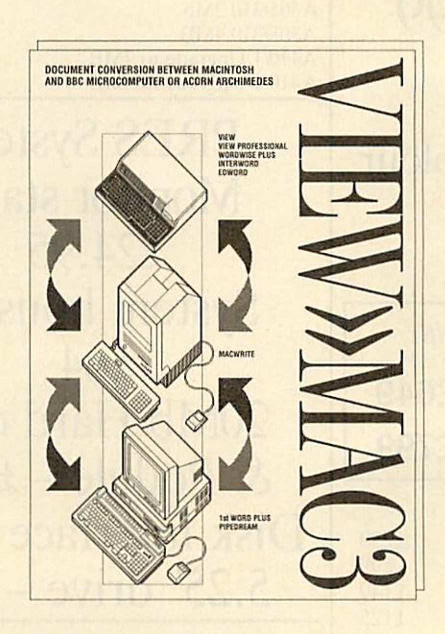
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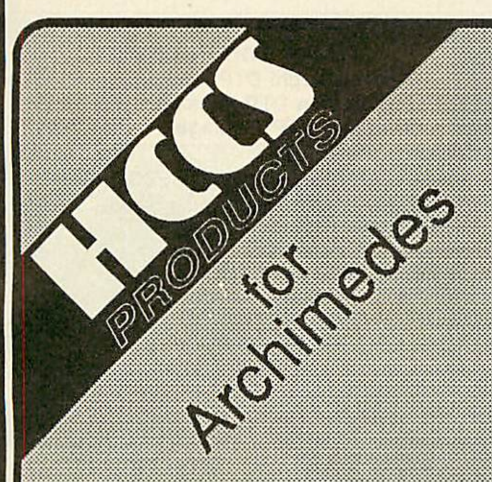
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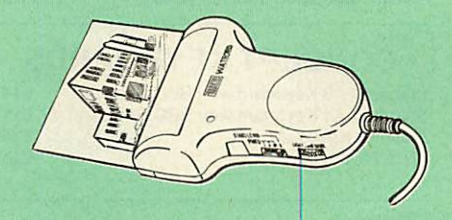
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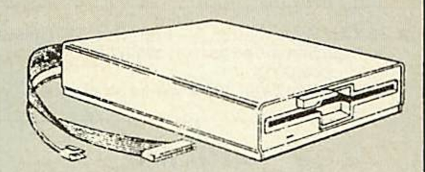
ULTIMUM – Archimedes A3000 Podule Racking System

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64K Upgrade Kit for B+	£32
Acorn 1772 DFS Kit complete	£49
ECONET Upgrade Kit for BBC B	£42
ALL ECONET UPGRADES Available	
ARIES' IEEE Interface for BBC B & Master	£238
Morley Teletext Adaptor with ATS Rom	£99
Filestore E01S £899	Filestore E40s £749
Filestore E60S £949	Ecolink £270

(Carr. £2 to £7 depending on the weight)

Continued→ → → → → → → → →

MONITORS



MICROVITEC 14"

- 1431 – Standard resolution as used on the BBC television computer programme £175
- 1451 – Medium resolution, suitable for word processing in mode 0 £219
- Cub3000 Medium Res for A3000 £195
- 1455 – MS Medium resolution, ideal for Archimedes £220
- 1441 – High res, exceeds the capabilities of the BBC Micro £359
- 1431AP RGB + PAL and AUDIO £199
- 1451AP RGB + PAL and AUDIO £255
- 2030 CS 20" Med Res £380
- 2040 CS 20" Hi Res £675
- Dust Cover for Microvitecs £5.50
- **Touchtec 501 Touch Screen £239**

14" MULTISCAN COLOUR

- **TAXAN** 775 Plus – 0.28 Dot pitch Ultra high resolution, anti-static screen £399
- **TAXAN** 770 LR Low Radiation, auto-scanning Ultra High Res £429
- **TAXAN** Multiscan 870 16" Monitor £575
- EIZO 8060H – For technical info. read the review in Micro User, Jan. '89 £389
- EIZO 9060SZ Low Radiation, Super High Resolution, Antistatic screen, multiscan monitor for a wide range of applications. 800 dots x 600 lines. Display for high res VGA. 0.28 Dot pitch £469

- **TAXAN** Super Vision 3 – High Res 12" Colour Monitor/with green screen switch for wordprocessing
  Special Offer **£179** (While stocks last)

PHILIPS

- **BM7502** 12" Hi-res Green Monitor £70
- **BM7522** 12" Hi-res Amber Monitor £71
- **CM8833** 14" Med. Res Colour Monitor £215

STAR BUY

- **PHILIPS 14"** Medium Res, dark glass, attractively finished Colour Monitor. A push-button switch toggles between Hi-Res monochrome green text mode and full colour display. (Please state the type of Connecting Lead you require).

ONLY £189

- **PHILIPS 14"** Refurbished monitor, same as above at a special offer price Only **£120**
  (Offer valid while stocks last)

Dust Cover for Philips Monitors **£6**
(Securicor carriage on Monitors £7)

SWIVEL BASES

By simply placing your monitor on one of our front adjustable professional swivel bases (see drawing at the top), you can easily adjust the viewing angle.

for 12" Monitors **£8** (carr. £2.50)
for 14" Monitors **£12** (carr. £2.50)

Anti Glare VDU Screen

These extremely effective, easy to install, 12" & 14" VDU screens eliminate harmful glare, improves contrast on colour monitors. Increases productivity in offices. A must for wordprocessor users.

£12

SPARE LEADS

BNC Lead for Zenith or Philips	£3
Skart Monitor Lead	£5
RGB lead for TAXAN Monitors	£3
Archimedes Colour Monitor Lead	£7.50

CONCEPT KEYBOARDS

Standard A3 Keyboard with BBC Software	£143
Standard A4 Keyboard with BBC Software	£117
Archi A3 Keyboard	£144
Archi A4 Keyboard	£118

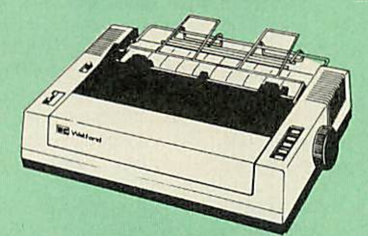
Roland Plotters

(Official Roland Appointed Distributor)

DPX 2500	£2495	**DXY 1100**	£595
DXY 1200	£835	**DXY 1300**	£1015

Panasonic KX-P1081





SALE OFFER only: **£127**

(Price includes, FREE a 4ft Printer Lead, and a Dump Out 3, Screen Dump ROM worth £35 with every KX-P1081 printer purchased from us)

KX-P1180 Printer Offer

Panasonic KX-P1180 printer, Dump Out 3, Screen Dump ROM & a BBC printer lead.

Offer Price £136

Panasonic Printers

- **KX-P1124** 24pin 80col. 192/63 CPS £215
- **KX-P1540** 24pin 136col. 240/80 CPS £415
- **KX-P1592** 9pin 136col. 216/45 CPS £275
- **KX-P1595** 9pin 136col. 288/61 CPS £345
- **KX-P1624** 24pin 132col. 192/63 CPS £349
- **KX-P1695** 9pin 132col. 330/86 CPS £349
- **KX-P4420** NEW 8PPM Laser
  Launch Offer £949

- **Panasonic KX-P4450i** LASER PRINTER
  Latest technology at Watford's special offer price £1,225
- Spare Toner **£29**
- A4 Feeder £55
- Drum Unit **£149**
- Developer £115
- 1MB RAM Upgrade £299
- 2MB RAM Upgrade £585

Panasonic Accessories

Cut Sheet Feeders

KX-P1592/1595 (P32)	£175	KX-P1540 (P35)	£175
KX-P1124 (P36)	£85	KX-P1180 (P37)	£79

BUFFERS

P12	4K buffer Board for 1081	£55
P42	32K buffer Chip for 1592/1595	£16
P43	32K Buffer Chip for 1540/1124/1180	£16

Serial Interfaces

P17 P1081/1592 £32 **P19** P1124/1180 £55

Original Panasonic Ribbons

Guaranteed to last 3 million characters

P110	for KX-P1081, 1592 & 1595	£8
P115	for KX-P1180	£8
P145	for KX-P1124	£8
P140	for KX-P1540	£10

Colour Ribbons for KX-P1081, 1592 & 1595
Brown, Blue or Red **£9.95 each**

INTEGREX COLOUR JET

- Colour Jet 132 Printer £515
- Paper Roll £6.50
- Screen Dump Software £10
- Colour Cartridge £19.50
- Black Cartridge £11.25
- 100 A4 OHP transparencies £55
- 8K Serial Interface Optional £123

Citizen Printer Swift 24 £249

NEC PINWRITER P6/P7 Plus

NEC P6+ 80 columns	£439	NEC P7+ 136 columns	£575
Colour Option	£74	Serial Interface	£73
Cut Sheet Feeder	£125		
NEC Ribbons for		P6 £8;	P7 £9.50

Hewlett-Packard Printers

HP Desk Jet +	£549
HP Desk Jet Cartridge	£20
HP Desk Writer	£669
HP LaserJet Series IIP	£845
HP LaserJet Series III	£1235
HP Laserjet IID	£845
HP Paint Jet Colour	£699
HP Quiet Jet Plus	£425
HP Scanjet Plus	£1199
HP Thinkjet	£269
Laserjet II TONER	£85
Series II 1 Meg RAM	£199
Series II 2 Meg RAM	£399
Series IIP 1 Meg RAM	£215
Series IIP 2 Meg RAM	£449

Star Printers

LC10 Printer	£129	XB24-10 r	£379
LC10 Mk II	£160	XB24-15	£499
LC10 Colour	£168	XB Colour Kit	£35
LC15	£259	LP8 II Laser	£1175
LC24-10	£199	LP8 IIT Laser	£1599
LC24-15	£325	Starscript	£1799
LP8 Laser	£1199		

Cut Sheet Feeder

LC10/LC24-10	£65	LC15/LC24-15	£125
XB24-10	£80	XB24-15	£139

EPSON PRINTERS

EX800	£429	LQ860 Colour	£535
EX1000	£564	LQ1050	£540
FX850	£315	LQ1060	£649
FX1050	£385	LQ2550+	£899
FX1060	£679	LX400	£129
GQ5000 Laser	£975	LX850	£179
LQ400	£198	SQ850	£515
LQ850	£439	SQ2550	£869
LQ550	£269		

CUT SHEET FEEDERS for

EX800/FX800/850/LQ800/850	£130
FX1000/LQ1000/1050	£175
LQ2550	£390
LX400/800/850/LQ400/500/550	£69

TRACTOR FEED for

LQ800 **£44**; LQ850/FX850 **£69**; LQ1050/FX1050 **£85**; LQ2500 **£90**; LQ2550 **£90.**

ACCESSORIES

- EX800/1000 Colour Option £45
- EX800/1000 Colour Ribbon £14
- LQ2500 Colour Option £65
- Multifont Card for LQ550/850/1050 £95

(Securicor Carriage on Printers £7)

EPSON PRINTER INTERFACES

All these interfaces fit inside the printer

RS232	£32	RS232 + 2K Buffer	£52
IEEE 488	£40	RS232 + 8K Buffer	£79

PRINTER LEADS

BBC Centronics 4' long	£5
BBC Centronics 6' extra long	£7
Compact's Special Centronics Lead	£7
Archimedes Printer Lead 6'	£6
Nimbus Centronics Lead	£6
IBM Parallel Lead 6'	£6
Double Ended 36 way Centronics Lead 4'	£7
Double Ended 36 way Centronics Lead 6'	£9
MSX Centronics Parallel Lead 4'	£12
RS232 Leads (Various)	P.O.A.

Listing Paper (Perforated)

- 1,000 Sheets 9.5" x 11" Fanfold Paper £7
- 2,000 Sheets 9.5" x 11" Fanfold Paper £11
- 1,000 Sheets 9.5" x 11" NCR 2 Part Fanfold £21
- 1,000 Sheets 15" x 11" Fanfold Paper £9
- 1,000 Sheets true A4 Fanfold Paper 70gms £11
- 2,000 Sheets true A4 Fanfold Paper 70gms £21
- Teleprinter Roll (Econo paper) £4

(All our Fanfold paper is Micro perforated leaving a smooth clean edge when the tractor feed strips are detached).

Carriage 1K Sheets £2.50, 2K Sheets £3.00

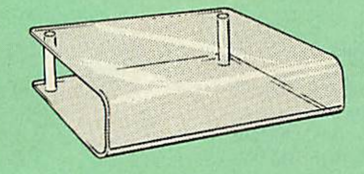
PRINTER LABELS

(On continuous fanfold backing sheet)

1,000 90 x 36mm (Single Row)	£5.00
1,000 90 x 36mm (Twin Row)	£4.90
1,000 90 x 49mm (Twin Row)	£7.50
1,000 102 x 36mm (Twin Row)	£6.25

Carriage on 1,000 Labels £1.00

Perspex Printer Stand



Give you Computer System a touch of Class with our elegant, smoke finished Perspex Printer stand.

80 Column version	**£16** (carr £3)
136 Column version	**£20** (carr £4)

Professional Printer Stand



The professional printer stand takes hardly more space than your printer. Due to the positioning of the paper feed and re-fold compartments ie. one above the other, the desk space required for your printer functions is effectively halved. Its ergonomic design ensures smooth paper flow and automatic refolding.

80 Column version £28 (carr. £3)
132 Column version £30 (carr. £4)

Printer Ribbons & Various Dust Covers

Type	Ribbons	Dust Covers
Brother HR15/20	£3.00	–
BBC Micro	–	£3.50
BBC Master	–	£4.00
Archimedes Micro pair	–	£9.00
Citizen 120D	£3.95	£4.50
DMP2000	£3.75	£4.75
EX/LQ800	£4.50	£4.50
EX/LQ1000	£6.75	£5.00
RX/FX80/85/800/MX80	£3.25	–
FX/MX/RX100/1000	£5.00	–
Kaga/Taxan KP810/815	£4.90	£5.00
LQ500/550/800/850	£4.50	£6.00
LQ1050/LQ2500	£7.00	–
LX80/86/800/850	£3.25	£4.50
M1009/GLP	£3.80	£3.75
NEC P2200	£6.00	£5.00
Panasonic KX1080/81	£3.50	£4.75
Panasonic KX-1124	£8.00	£5.00
SQ2500	£23.00	£5.50
Star LC10/NL10	£4.25	£5.00
Star LC24-10	£5.00	£6.00
Olivetti Ink Jet Cartridges (set of 4)	£9	

Our attractive Dust Covers are manufactured from translucent PCV. The seams are stitched and edges are taped to prevent splitting due to continuous use.

Universal Printer Sharers/Changer

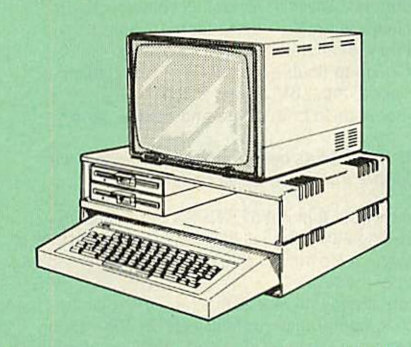
Connect upto 5 Micros to 1 printer or 5 Printers to 1 Micro with our combined, Sharer/Changer. These Units are made to a very high standard. For extreme reliability, they all have Printed Circuit Boards mounted inside the case, (not a Spaghetti Junction of wires). Internal connection is made via high quality ribbon cables.

(Ideal for School environments)

Connects	Serial	Centronics	P&P
2 to 1	£20	£22	£3
3 to 1	£27	£30	£3
5 to 1	£36	£39	£4

(Cables extra at £6 each. Please specify type required when ordering)

PLINTHS FOR BBC MICRO, MASTER & PRINTERS



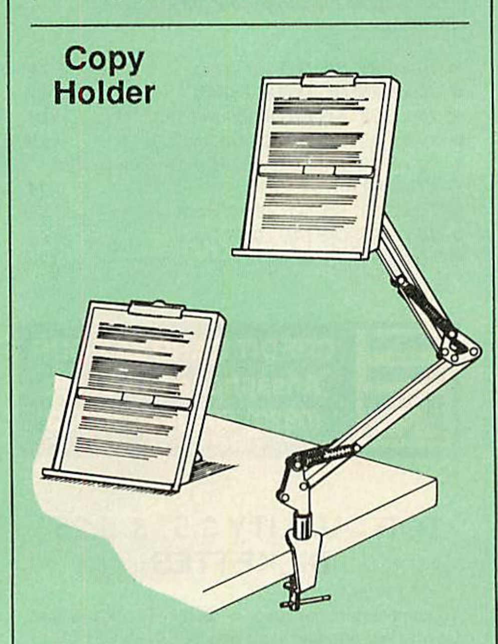
Protect your computer from the heat of your VDU. Our micro plinths have slots for maximum ventilation. The single plinth is suitable for a BBC and VDU, whilst the double height version provides enough room for our stacked disc drive and other peripherals like, Eprom programmer, music unit or simply discs & stationary. The computer slides neatly in the lower section allowing easy access to remove the lid.

The single printer stand is equally sturdy but instead of cooling slots it has elegant cutouts on the sides. This allows easy access to paper from all sides. Colour: BBC Beige.

Single BBC Plinth	420 x 310 x 105mm	**£13**
Double BBC Plinth	420 x 310 x 210mm	**£24**
Printer Plinth	420 x 310 x 105mm	**£12**
Single Master Plinth	490 x 310 x 105mm	**£14**
Double Master Plinth	490 x 310 x 210mm	**£26**

(Carr. Single plinth £2; double plinth £3)

Copy Holder



Whether you want to type in your latest program or the draft of a new trilogy, Watford's manuscript holders are superb for holding you paper at the ideal height and angle to allow you to read and type in ease and comfort.

Available in 2 full A4 versions, desk resting and shelf clamping. Paper is held firmly by means of a plastic retaining ruler and a clip grip. (for resting books or magazines, the desk top version is recommended).

Desk Top **£7** (carr. £3)
Angle poise **£12** (carr. £3)

Handy Printer Switch

A handy two way compact printer switch that enables you to connect 2 Micros to 1 printer, or 2 printers to 1 Micro. Attaches easily to your printer, monitor, etc. A low cost solution for educational establishments. Ideal for those wishing to use a dot matrix and a laser printer. Available in two configurations.

Compact AB Switch Centronics	£19
Compact AB Switch RS232	£18

(Cables extra at £6 each)

MEGABUFFER 256



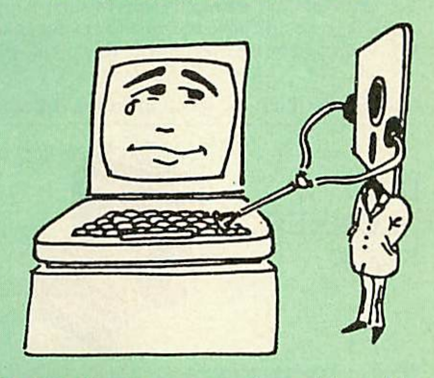
The Smallest 256K Printer Buffer Unit in the world
38mm x 130mm x 134mm.

This new Megabuffer 256 from Watford is a full featured 256K Printer Buffer. The features are:

- Improves efficiency by making more efficient use of computer and printer.
- Compatible with any computer and printer that uses Centronics Parallel connections including all BBCs, IBM PCs, etc.
- Total compatiblity with all software.
- Cheaper phone bills when using your Modems.
- Ideal for those doing large graphics screen dumps that are slow to print.
- Multi-Copy facility allows you to print several copies via Megabuffer without going through your computer.
- Data Dump facility is included.
- Built in text unit for both the buffer & your printer.

Only £119 (carr £5)

DIAGNOSTICS DISC



The BBC Micro is a very complex machine and thus diagnosing a fault can be very difficult. At Watford Electronics, we realise how difficult it can be when faced with a problem, finding yourself a long way from your nearest dealer, or even just uncertain about your Beeb's health, but not wanting to waste time and money taking it to be looked at.

The solution to these problems is here now, in the form of the Watford's Diagnostics Disc. This excellent utility is specially designed to test out the following areas of your Beeb:

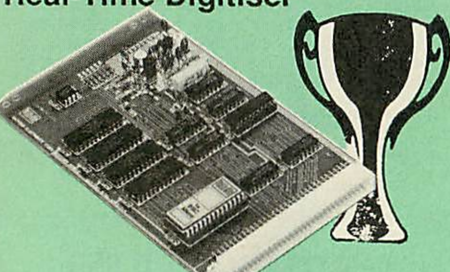
RAMs, ROMs, ULAs, Sound, Keyboard, Disc, RS423, ADC, User Port, Printer Port, Cassette, Joysticks, Speech, Disc Drives, 6502 and Z80 2nd Processors.

This utility is an invaluable aid for all those who take the reliability of their system seriously. A comprehensive manual provides full operating details and a list of possible causes and remedies for any faults that you may find along the way. The package also enables a permanent equipment and service record to be maintained.

Only £20.00
(Only suitable for BBC B with 8271 DFS)

Continued→ → → → → → → → → →

Archimedes Real-Time Digitiser



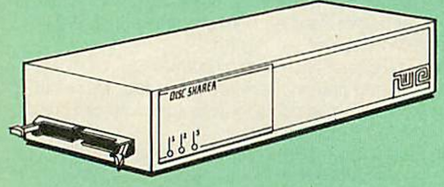
Now supplied with NEW RISC OS Version Software

Watfords' Archimedes Video Digitiser is the most sophisticated digitiser ever designed for a micro. It provides a fast and flexible means of capturing images from a video camera or recorder for display and manipulation on the Archimedes range of Micros. Off-air televison signals may also be digitised via a video recorder or TV tuner. Please write for further details.

Price £215

A Set of Colour Filters for colour image grabbing using a video camera	£16
New Risc-OS Software Upgrade	£39

DISC DRIVE SHARER



(Ideal for educational establishments)

At last, a low cost alternative to the Econet system.Watford's Intelligent Disc Drive Sharer allows you to connect 3 BBC micros (model B, B+ and Master series) to a single or double disc drive. Running under any DFS or DDFS, this intelligent unit will automatically queue the computers. Each computer has a status light dedicated to it. If it is green you will get immediate access to the disk, and red means that you are next in line. The unit plugs directly into the disc drive socket on each computer and is powered by the mains. (N.B. Not for use with ADFS.)

Offer Price : **£55** Price includes 3 Cables

DISC PLONKER RACK



When using ones micro, there is a tendency to have more than one Disc on the desk. This exposes them to the harzards of fingerprints, scratches, dust, coffee and an untidy desk.
Why not protect your valuable data from all these hazards with the help of our extremely handy and low cost DISC PLONKER RACK. Holds up to eight 5.25" discs.

Protection at Only: **£2**

Acorn & Watford DFSs

- Watford sophisticated DFS ROM **£16.00**
- Watford DFS Kit complete **£69.00**
- We will exchange your existing ROM for Watford's ultimate DFS ROM at only **£12.00**
- DFS Manual (comprehensive) **£6.95**
- Acorn DNFS ROM **£17.00**
- Acorn ADFS ROM only **£25.00**
- Acorn 1772 DFS ROM Kit **£49.00**

(The single Density DFS system is now old technology. Like Acorn, Watford too have decided to replace it with the their more up-to-date 1770 DDFS interface. We have informed most of the software houses of this decision in order that they can ensure compatibility with our highly sophisticated and fully Acorn compatible DDFS).

Watford's MkII 1772

Single/Double Density DFS

Many of our customers have wanted to use our superior DDFS and Acorn ADFS together. Now our Mk II DDFS Board with its 1770 Disc Controller, has been adapted to allow the use of Acorn ADFS as well. It also has all the commands of the Acorn's 1770 DFS, plus the added features.

Added features include:

- Acorn ADFS compatible – Use ADFS on our DDFS board.
- Tube host Code – No longer any need to have the DNFS in your machine to use Co-Processors, even the CoPro and Master 512.
- Auto 40-80 Track sensing – no need to fuss with 40/80 track switches (even works with protected disks).
- An extremely powerful 8271 emulation – ensuring compatibility with almost all software.
- New low profile – small footprint board.
- Fits with all third party ROM boards.
- Option to double the speed of file handling operations – BPUT and BGET.
- Operates in both single and double density modes.
- OSGBPB has been recoded, increasing still further the speed of file handling.

Please note that not all DDFS's are capable of providing either the full 80% storage increase or of allowing a file the full size of the disk – Ours allows both of these!
If you already have a DDFS (any manufacturer), and wish to upgrade to our MkII version, then simply return your existing ROM and DDFS board and we will supply the new DDFS for only £39.00.

- SPECIAL PRICE **£44.00**
- DDFS Manual (No VAT) **£6.95**
- We will exchange your existing DFS Kit for our sophisticated DDFS for only **£30.00**

Please note, as the MkII DDFS is a hardware and sofware upgrade, it is not possible for existing Watford DDFS users to simply exchange the ROM for the new version.

3M – DISKETTES

3M – SCOTCH Diskettes with Lifetime warranty from Watford Electonics your 3M Appointed Distributor

- *10 x 5.25" S/S D/D 40T (744)* *£5*
- *10 x 5.25" D/S D/D 40T (745)* *£7*
- *10 x 5.25" S/S D/D 80 Track (746)* *£8*
- *10 x 5.25" D/S D/D 80 Track (747)* *£9*
- *10 x 5.25" 1.6M D/S D/D High Density for IBM XT and AT* *£14*
- *10 x 3.25" S/S D/D 40/80 Track* *£9*
- *10 x 3.25" D/S D/D 40/80 Track* *£9*
- *10 x 3.5" Double Sided High Density* *£22*



CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383

TOP QUALITY 3.5" & 5.25" DISKETTES

To complement our range of Quality Discs and Disc Drives. WE are now supplying SPECIAL OFFER packs of 10 Lifetime guaranteed discs. Each disc has a reinforced hub ring. Supplied complete with selfstick labels and a Plastic Library Disc Box.

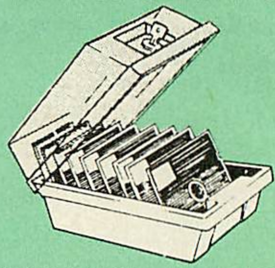
- *10 x **M3** 3.5" D/S D/D 80 Track* *£9*
- *10 x **M9** 3.5" D/S High Density* *£22*
- *10 x **M4** 5.25" S/S D/D 40 Track* *£5*
- *10 x **M5** 5.25" D/S D/D 40 Track* *£7*
- *10 x **M7** 5.25" D/S D/D 80 Track* *£9*
- *10 x **M8** 5.25" D/S H/D Hi-Density* *£13*
- ***M2** 3" Double Sided* *£3 each*

FLOPPY HEAD CLEANER KIT

The heads in floppy drives are precision made and very sensitive to dirt. The use of cleaner Kit is a sensible precaution against losing valuable data. It is recommended to clean the drive head once a week. it is very simple to use. Available in 3.5" & 5.25", please specify.

Price £4

ANTISTATIC LOCKABLE DISC STORAGE UNITS

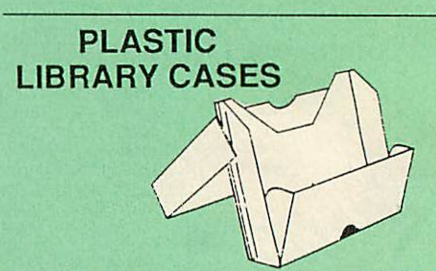


Gives double protection – Strong plastic case that affords real protection to your discs.
Antistatic helps avoid data corruption whilst in storage. The smoked top locks down.
Dividers and adhesive title strips are supplied for efficient filing of discs.

- M35 – holds up to 50 5.25" discs **£4.95**
- M85 – holds up to 95 5.25" discs **£6.95**
- M25* – holds up to 25 3.5" discs **£4.95**
- M50 – holds 50 3.5" discs **£6.50**
- M10 – holds 8 of No. 10 Data Cartridges **£15**

* Not lockable

PLASTIC LIBRARY CASES



Holds up to 10 5.25" Discs. **Only £2.00**

DUST COVERS (For our Disc Drives)

Single CLS (without PSU)	£3.20
Single CS (with PSU)	£3.25
Twin CLD (without PSU)	£3.85
Twin CD (with PSU)	£3.90

DISC ALBUMS

Attractively finished in black leather-look vinyl. Stores up to 20 discs. Each disc can be seen through the clear view pocket.

£4

Special BULK OFFER on 5.25" DISCS

(Supplied packed in Anti-Static Lockable Storage Units)
(Lifetime warranty on Discs)



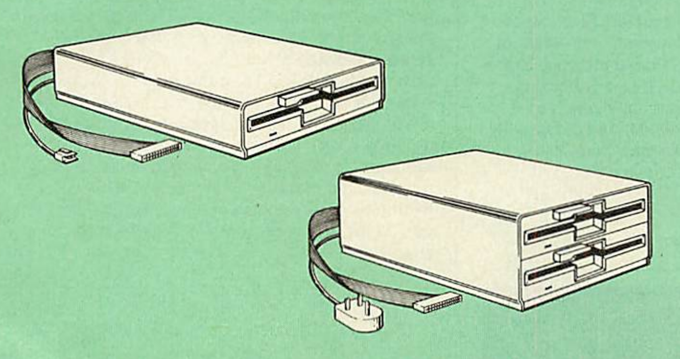
BULK PACK DISCS in lots of 100

Type	S-S 40T	D-S 40T	D-S 80T
● Without Sleeves	£30	£35	£40
● With Sleeves	£33	£38	£43

Quality Disc Drives from Watford

To help you decide which drive is the most suitable for your needs (and your pocket!), we have produced the table below.
The tinting on some of the boxes is used to indicate which Drives are 40 track (non-tinted) and which are 80 track (tinted). All our 80 track drives are already fitted with a 40-80 select switch.
***All our Disc Drives are Double Sided and will operate in both Single and Double Density modes.** Extensive experience of the usage of disc drives suggests that the JAPANESE drives currently represent about the best in terms of speed, reliability and overall "elegance" available for the BBC Micro.*
Various UK "manufacturers" of disc drives for the BBC micro (more accurately, "packagers" label other manufacturers drives with their own name). We buy the high qulity NEC and Mitsubishi drives in large quantities directly from the manufacturers, package them and sell them at "dealer" prices direct to the public. If you look around the popular BBC micro press, you will find that the prices we quote for the top quality, new slimline disc drives are, virtually without exception, some of the best around. These prices, coupled with the backup of one of the country's largest distributors of BBC peripherals provides a superb deal.
*Unless you anticipate using dual drives in a fully expanded BBC system for long periods of time with little ventilation, then we suggest that our range of "CL" disc drives without the PSU (Power Supply Unit) would be quite adequate (extensive tests within our workshops have confirmed this). All drives are supplied complete with a SPECIAL UTILITIES Disc, Cables and Plugs. The Drives with power supply have a mains moulded plug for safety purposes. **Ideal for Schools & Colleges.** We are now able to supply all single disc drives with Power Supply, in either single or dual case. (Dual case has a twin data cable and a power supply capable of driving two disc drives) allows easy expansion to a dual drive unit, at a later date. Prices stated in the pricing boxes below are for single drives in standard single cases. Single drives in a dual case cost an extra £18. (At Watford we anticipate your needs of tomorrow, not just today!)*
When using a BBC Micro, most people find themselves short of desk space. The Watford's BBC Micro plinths form an ideal way of recovering some of this precious space) your BBC Disc Drive and Monitor can all occupy the same vertical footprint and still be comfortably situated. With the Watford Double plinth, your Disc Drive is mounted vertically at one side, leaving a very valuable area directly in front of you for such useful items as spare discs, pen, paper, reference manuals, etc. Follow the trend with a Watford plinth. (Turn to the 4th page of our advert for the Plinths).
P.S. All our 5.25" Disc Drives with PSU are compatible with the Compact Micro. All you require is the special Compact Disc Drive Cables designed by us.

Our Disc Drives conform to BS415



"Test Bureau Approved for Use in Education"

Capacity	Drives without P.S.U.		Drives with P.S.U.	
	Single	Twin	Single	Twin
400K (720K)	CLS400S £74		CS 400S £83	
800K (1,44M		CLD 800S £149		CD 800S £162

● TWIN Disc Drive Case, complete with Power Supply & Cables **£43**
Securicor carriage on Disc Drives £6 to £7

Prefix *C = Cased Drive*
L = Less PSU
S = Single
D = Double

Suffix ***S** = 40-80 Switchable*

e.g. *CLS400S = Cased Disc Drive, Less power supply unit, single 5.25" 400K, (720K in double density); Double sided; 40/80 track switchable.*

Refurbished Disc Drives now available
CLS400S £50 CLD800S £98 CS400S £59 CD800S £115

Special Cable to connect both 3.5" and 5.25" Disc Drives simultaneously to the BBC Compact £13

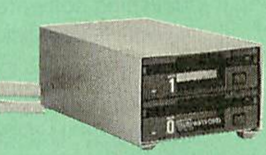
Special 40/80 Disc Drive/DDFS Mk II Offer



- The popular 40/80 track 400K single Disc Drive, Double Sided, cased with Cables. Plugs directly to your Micro.
- Watford's extremely popular DDFS Disc Interface (allows 720K storage). Will run in both Single & Double Density modes.
- A comprehensive User Friendly Manual.

A Bargain at Only **£119** (£7 carr) (Offer valid while stocks last)

3.5" DISC DRIVE OFFER



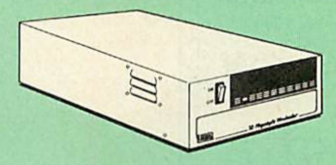
These top quality 3.5" Double sided, 80 track, 1 Megabyte (unformatted each Disc Drives), are attractively finished in BBC beige. They are supplied complete with all cables and a Utilities Disc.

Drives to connect to BBC Micros own PSU
- **CLS35 400K Unit £65**
- **CLD35 Twin 800K £119**

Drives with built-in Power Supply Unit
- **CS35 Single 400K £85**
- **CD35 Twin 800K £129**

(P.S. CS35 Single is supplied in a twin case with a blanking plate to enable easy expansion to a dual drive at a later stage).

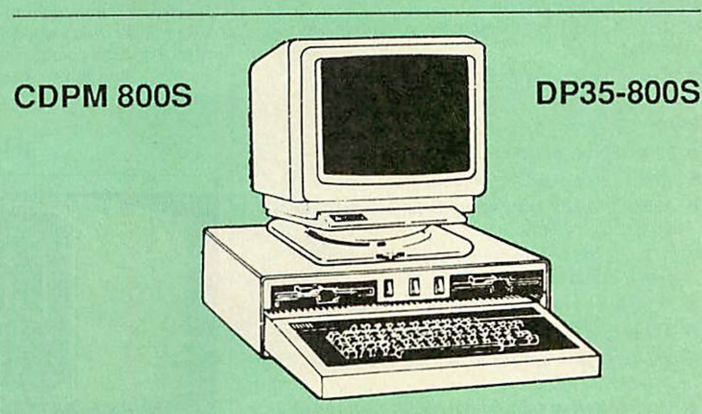
WATFORD's WINCHESTER DRIVES



Undoubtedly the best value for money Winchester Hard disc available anywhere for the BBC Micro.
This 30 Megabyte hard disc is completely compatible with the Acorn ADFS – that's why we have bundled it with each Winchester drive, along with a Utilities Disc.
Finished in rugged metal and fetching BBC beige, the Winchester has an internal fan, so quiet you won't even hear it! A switched mode power supply and a neon-lit on/off switch are there along with a light on the hard disc to tell you when it is working – just compare the price with our competitors' 20 or 28 Mbyte discs!
Compatible with the Master, and the BBC B (with 17 X disc interface).

● 30 Megabyte BBC Hard Disc **£395** (carr £7)

CDPM 800S **DP35-800S**



Twin 800K Double sided 40-80 track switchable disc drives mounted in an attractively finished Beige colour plinth for the BBC Micro. Supplied complete with integral power supply, cables and Utilities disc. The mains switch with neon On/Off light indicator, and the two 40/80 track switches are mounted on the front panel for ease of use.

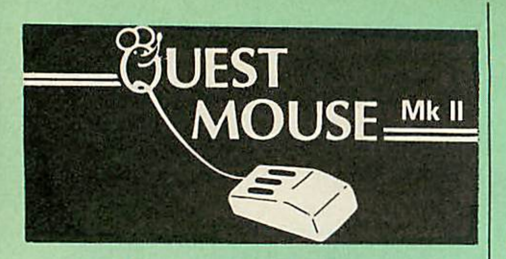
CDPM 800S for the BBC B & Master £175

A Double disc drive with a difference! Times are changing fast for the floppy disk, and whilst the current standard for the BBC B and Master series is the 5.25" disk, the standard of the future will most certainly be the smaller; faster and more reliable 3.5 inch disks – now a standard feature of both the Master Compact and the Archimedes Series.
To support the present disc drive users, and cope with the future, we havo designed our own plinth-mounted disk system – called the DP35 800S. It contains both the 5.25 inch and the 3.5 inch drive formats as well as offer a firm and rigid support for a monitor on top. With the BBC Micro underneath, the plinth makes a surprisingly small footprint on the desk – leaving you more space to work with.
The 5.25" disc drive is 40/80 track switchable. DP35-800S has its own power supply, independent of the BBC Micro.

DP35-800S for BBC/Master £165

(Securicor Carr. £7)
(The above drive units are 2 Megabytes unformatted)

Continued→ → → → → → → → →



- Quest Mouse II & Quest Paint £58
- Quest Mouse II, Quest Paint, AMX Stop Press & Pagefont £89
- Quest Mouse II only £29
- Quest Paint Software only £34
- Quest Font Disc (22 Text Fonts) £15
- Quest Mouse Mat (Red or Blue or Green please specify) £3
- Part Exchange your unreliable AMX Mouse for a Quest Mouse for only £22

(P.S. Quest Paint is not compatible with BBC Compact)



Winner of the BBC Acorn User 1990 Award for the Best Art/ Graphics software



Quest combined with ConQuest and Acornsoft GXR ROM make up THE MOST POWERFUL drawing packages available for the BBC range. Quest Paint is able to take advantage of almost any additions to your machine, such as Shadow or Sideways RAM. ConQuest takes this principal even further, by utilising the otherwise normally incompatible Sideways RAM facility by holding pictures in them.

Some of the features are:

- *Pick filenames off the screen for loading and saving.*
- *Rotate a cutout to any angle and Distort it to any four sided shape.*
- *Has Built in Font editor.*
- *Default brushes and patterns on startup.*
- *16 x 16 font available on start up.*
- *Ability to reset patterns, fonts and brushes to default at any time.*
- *ROM based enhanced Epson and compatible printer dump.*
- *ROM based enhanced extended picture routine.*
- *Ability to create and abort extended pictures.*
- *Improved disk access speed for extended pictures.*
- *User definable sideways RAM driver for incompatible sideways RAM systems.*
- *Ellipses at any angle on Master 128 (or B with GXR ROM).*

ConQuest ROM Package £30
(Price includes software in ROM and a comprehensive Manual).
(Not Compatible with BBC Compact)



ARCHI Mk II MOUSE

An extremely reliable replacement mouse for Archimedes Micro £39

RB2 Marconi TRACKER BALL

RB2 (AMX/Quest compatible)	£45
RB2 including Quest Paint	£75
RB2-A for Archimedes	£46

THE NEW Mk III AMX MOUSE

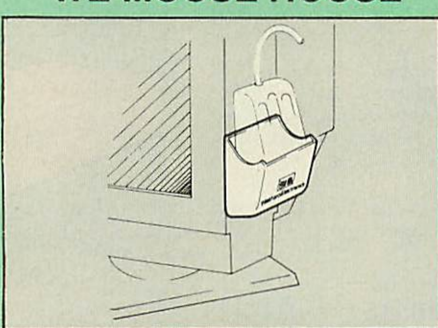
Inc. Super Art package

ONLY: £59 (carr £3)

(Please specify for BBC, Master or Compact)

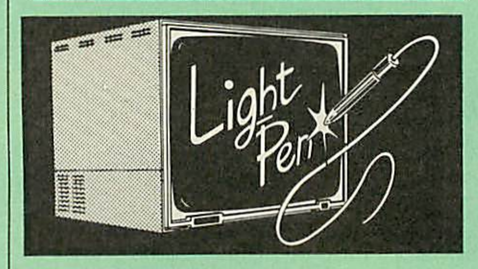
MOUSE MAT	£3
AMX MOUSE ONLY	£29
AMX SUPERART Package	£34
AMX STOP PRESS – A Desktop publishing software. Works with Keyboard, Joystick or a mouse	£32
PAGE-FONTS – Over 20 Fonts for use with AMX Pagemaker	£13
AMX DESIGN (ROM)	£55
AMX XAM Educational	£15
AMX EXTRA EXTRA	£16
AMX MAX A gem of desktop (ROM)	£20

WE MOUSE HOUSE



Treat your mouse to a cosy Mouse House. This handy little gadget solves the problem of where to store your mouse when it is having a rest. Made of sturdy plastic, the WE Mouse House attaches to the side of your computer, monitor, disc drive or desk. It protects it from damage when not in use, yet within easy reach when you need it again. There is also a second compartment for your pens and pencils – and at £4 it doesn't cost a rodent's ransom.

Price £4



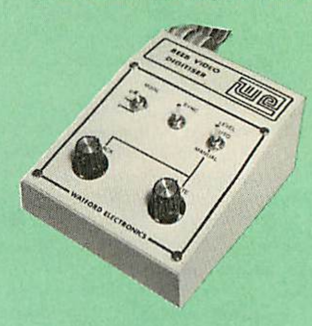
Our Mark II Light Pen is the very latest in light pen technology. It is totally insensitive to local lighting conditions and works with many different monitors. The pen only responds to the High Frequency light produced by your monitor/TV. An LED indicates when valid video data is being produced. A conveniently located switch is also fitted. (Price includes FREE software Disc and Operating Manual)

Only £21

FLEET STREET EDITOR

Software pack for BBC Micro	£33
Software pack for the Master	£39
Admin Xtra Disc Utility	£13
Walt Disney Disc Utility	£13
Fonts N Graphics Disc Utility	£13

BEEB VIDEO DIGITISER



"Test Bureau Approved for Use in Education"

Using any source of composite video (colour or monochrome) and the Watford Beeb Video Digitiser, you can convert an image from your camera into a graphics screen on the BBC Micro.
This uses the full graphics capacity of the BBC micro in modes 0, 1 or 2. The video source may be a camera, video recorder or television, and is connected via the video output socket.
Images produced can be compressed, stored to disc, printed on an Epson compatible printer, directly used to generate graphics, analysed for scientific and educational use or converted to other formats e.g. Slow Scan TV or receiving a picture from a remote camera using a modem. The output from the digitiser exactly matches the graphics capability in each mode, with up to 8 levels of grey in mode 2. The unit connects into the User Port and automatically scans a complete picture in 1.6 seconds.
Both the black and white levels can be adjusted manually for the optimum picture, or switched to automatic for unattended use. The image produced can be reversed if necessary.
Full controlling software is supplied on a normal sideways ROM and this is easily accessed via additional ★ commands. The package is designed to allow easy input of complex screens and give full access of the data to the user. Once on the screen, the image can be used as a normal graphics screen, allowing any of the usual graphics commands in BASIC or other ROMs to work on it.
A special print dump routine is included with the driver programs. This is specially designed to produce a fast, correctly proportioned picture, with reduced "contouring", resulting in an accurate reproduction of the original image. Detailed examples of driving this unit from BASIC or other languages are all provided in the extensive manual supplied.

£109 (Carr. £5)

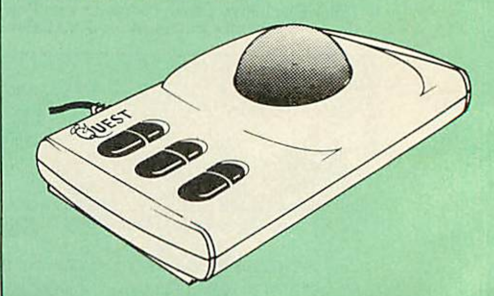
(BBC B+ and Master compatible, except Master with Econet)

(Price includes) Digitiser Unit, Software in ROM & a Comprehensive Manual)

NEW

QUEST – Tracer ball

An attractively finished, extremely reliable, mouse replacement, input device. Requires very little desk space. Connects directly to your BBC B, BBC Master or Archimedes Micro.



QT-10 BBC/Master Version	£32
QT-20 Archimedes Version	£35





Winner of the BBC Acorn User 1990 Award for the Best DTP/ Word Processor

The WAPPING EDITOR

The Wapping Editor from Watford Electronics represents a breakthrough in Desktop Publishing for the Beeb. The package includes a 64K ROM containing ALL the software needed to get into print fast; a very sophisticated graphics module, professional quality typesetting software, a word processor, a comprehensive font editor for designing your own typefaces, and a variety of printer dumps. This mouse-driven system is designed for the BBC B, the B+ and Master computers and will take full advantage of any Sideways and Shadow RAM that may be fitted. It will run under DFS, ADFS and Network filing systems and requires as a minimum just a single 40 track drive.

Included with the system is a utility disc containing several high quality fonts, various utilities and a ROM image of a Support ROM. A comprehensive 100 page manual completes the package. The Support ROM contains routines to allow an area to be rotated to any angle or distorted to any four-sided shape. Also included are facilities to draw ellipses at any angle and sectors, segments and arcs (in Master or BBC B with Acorn GXR). Another of the features of the Support ROM is a 'Turbo DFS' which gives DFS access times comparable with those of ADFS.

PAGE LAYOUT SECTION

The Wapping Editor may be used to create pages of any size from an A6 to a full A3 page. If none of the eight default page types suit your purpose, the stand-alone page creation program may be used to create pages to your own requirements. By using proportionally spaced fonts and genuine microspacing it is possible to print over 150 characters across an A4 page. A unique feature of the Wapping Editor is the 'A5 x 2' page size allowing two A5 pages to be printed side by side onto a single A4 sheet.

The graphics module is a mode 0 version of the highly acclaimed Quest Paint package, and incorporates all the same drawing facilities, e.g. pencil, brush, airbrush, polygon, circle, ellipse, fill, cut-and-paste, etc., etc.

Text may be typeset, either justified or unjustified, in any font anywhere on the page. Simply select which font and text document you wish to use, and pull out a rectangle on the page where you want the text to be – it's as simple as that! Multiple columns may be printed just as easily and a special 'expand' feature may be used to expand the microspacing so that the document exactly fits the space defined.

WORD-PROCESSOR

The integral word processor is the ideal tool for producing your text documents, although text can of course be read in from any of the other popular word processors such as View, Wordwise etc.

cont./-

THE FONT EDITOR

The font editor module will allow you to design your own typefaces or to modify the ones provided on the utility disc. This sophisticated editor has numerous functions designed to take the tedium and frustration out of producing good looking, well balanced fonts. Each character may be individually proportionally spaced and characters of any size up to 16 x 16 pixels may be defined.
Upgrading to the Wapping Editor could not be easier since the font editor will convert fonts from other packages, such as Quest Paint or Stop Press (formerly Pagemaker), into Wapping Editor format and a mode conversion utility will convert any screen in modes 1, 2, 4 or 5 into a full grey-scale mode 0 screen. Pictures may also be 'grabbed' from a video source by using the Watford BEEB Video Digitiser, either independantly or from within the Wapping Editor package.

Wapping Editor Software Pack	**£69**
Wapping Editor plus Mouse	**£89**

(Wapping Editor only works with Master Compact if a Mertec Expansion box is fitted)

Wapping Art Disc

Over 250K of clip art to cut and paste into your Wapping Editor pages. Pictures include maps, transport, people, media, sport, games etc. Two 'ratio' screens for use with hi-res and rotated A5 pages to ensure images are not distorted when printed out.

Music writing symbols in the form of pattern and brush for quick production of manuscripts are included together with staves.

There are two prepared hi-res pages layed out for printing labels, both single and double width. Ready made label designs are included but these can be easily replaced with your own designs.

A Mode 0 screen dump routine is also included. To pack such a large amount of data onto the discs the screens have been compressed and routines to compress and expand Mode 0 screens are included on both discs. Using the packing routine you can archive large numbers of screens onto a single disc.

£15

The Beeb HandScan
Hand-held Scanner for the BBC Micro



Watford Electronics are pleased to announce the launch of the first hand held scanner for the BBC Micro. HandScan is a compact unit which will allow photographs, diagrams, or any other documents to be digitised quickly and easily, to then be used in a desk top publishing package, art program, or even in your own Basic programs! These useful devices have been available for faster and more expensive micros for some time, but only now is Watford Electronics able to offer the BBC Micro computer.

The HandScan plugs directly into the 1MHz bus on the BBC while a comprehensive set of utilities provided by the sophisticated ROM firmware. The scanner has a resolution of either 100 DPI or 200 DPI when accuracy is essential. Pictures as wide as 4" may be scanned in mode 0 and various types of dithering may be selected to simulate the grey levels of a scanned picture.

All necessary software has been included in the firmware to allow the scanner to read images directly into our Wapping Editor with little more than the click of the mouse. The digitised picture may then be incorporated into your magazine, newsletter, report or any other document.

Beeb HandScan & Firmware **£135**

Wapping Font Disc

Sixteen Wapping Editor fonts including smaller versions of Oberon and Daisy and two new sizes of the standard font.
Also included are three Mode 0 screens containing giant 'headline' fonts to cut and paste to create extra smooth headlines.
Supplied complete with instructions.

£12



CREDIT CARD 24 HOUR Ansaphone Hot Lines (0923) 50234 or 33383



Laser Direct
For Archimedes Micro

By using the power of the Archimedes RISC processor, it offers the best of both worlds – print speed up to 5 times faster than typical Laserjet compatibles – uses outline fonts so that any font can be scaled to any size – works with all programs that use RISC OS printer drivers. Ideal for use with Genesis, !Draw, Acorn DTP, Impression, etc. Includes 50 sheet paper tray and a single sheet/ envelope tray. Requires one expansion slot and at least a 2Mbyte Archimedes. A very compact printer, a very low initial cost and very low running costs.

Launch Offer: £949

(For demonstration, call in at our retail shop)



Beeb PC (BASIC)

Beeb PC Basic is designed for program authors wishing to convert programs so that they will run on IBM personal computers. To convert BBC BASIC programs manually can waste days of valuable time with every occurrence of common statements such as PROC, DEFPROC, TAB, having to be changed. Beeb PC (BASIC) automates many of these changes, and will convert majority of BBC statements that are invalid for IBM BASIC into equivalent acceptable statements. In addition BBC BASIC data files can be converted to IBM BASIC format, with support provided for all BBC data formats:- INTEGER, REAL & STRING.

Price: £38



Beeb DOS 2.2

The BBC and IBM PC's are the most popular micros in the UK. The BBC is firmly established in the education sector and the IBM is the industry standard in the business world. The pools of information and applications held on these computers are immense, yet the means of passing information between them are very limited. Beeb DOS provides a practical method of transferring information between these two micros.

Beeb DOS is a collection of utilities which run on the PC's and enable it to read and write information on BBC discs. You can transfer files between your PC's 360K floppy, high density floppy or hard disc and your BBC discs. In addition Beeb DOS allows you to catalogue, format and compact BBC discs and delete, re-name, lock and unlock BBC files, all on PC's. Each Beeb DOS utility is written in IBM assembler and is run directly from PC or MS-DOS. The Beeb DOS utility can be run from floppy disc, hard disc or RAM drive.

Beeb DOS is supplied on an IBM 5.25", 360K disc complete with a comprehensive operating manual. (Will only work on 360K Disk Drives)

Price: £39

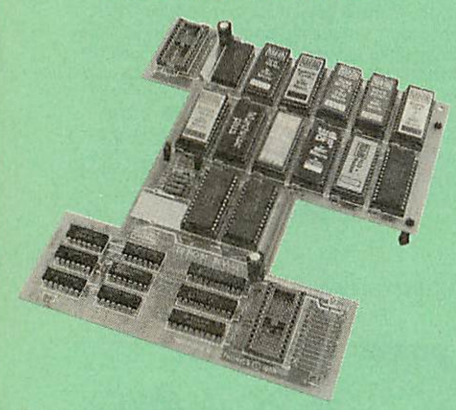
(Please write in for technical literature)

Continued→ → → → → → → → → →

STAFF VACANCIES

Watford Electronics is the leading supplier in the Acorn computer field and has established itself in the PC compatible market with its Aries PC computers. In its eighteen year history, Watford has always kept itself at the forefront of the new technology. Due to our latest expansion, we require staff to man our BBC/Archimedes and PC Technical Departments. Applicants will be required to be familiar with BBC/Archimedes hardware and software, and PC staff will need to be familiar with PC computer hardware. Good rates of pay, excellent prospects. Subsidised company accomodation is available to single persons if required. Telephone Keith Archer or Richard Overfield for interview, or write to us enclosing your CV.

SOLDERLESS SIDEWAYS ROM SOCKET BOARD



The key features of this new, no fuss, easy to install quality product from BBC leaders Watford Electronics are as follows:

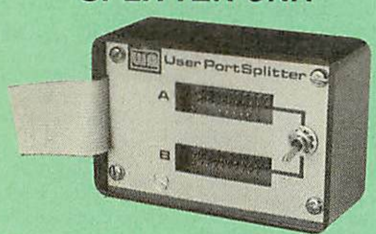
- Increase your BBCs capacity for ROMs from 4 to 16.
- **No soldering required.**
- Very low power consumption.
- Minimal space required.
- Compatible with Torch, DDFS, RAM Card, 2nd Processor, etc.
- Socket 14 takes two 6264 RAM chips.
- Read protect to make RAM "Vanish") allows recovery from ROM crashes.
- Battery backup option for RAM chips.
- Supplied ready to fit with comprehensive instructions.

Price: Only £35
Battery Backup fitted **£39**
Battery Backup only **£3**
16K Sideways RAM **£8.50**
(carriage £3)

- Sideways RAM Utilities Disc for Solderless ROM Board. Includes the options to load and save ROM Images and the facility to use Sideways RAM as Printer Buffer.

Only: £8

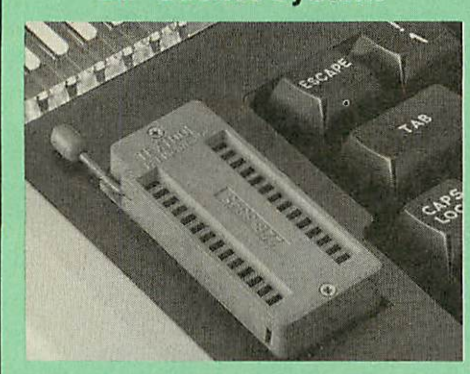
USER PORT SPLITTER UNIT



Gone are the days when you had to plug and unplug devices from the User Port. This extremely useful little device allows two units to be connected to the User Port simultaneously, and select between them simply by toggling a switch. This device is particularly useful for those people using Quest Mouse and the Watford Video Digitiser or any similar combination

Excellent Value at **£22** (carr £2)

Sideways ROM ZIF Socket System



Allows you to change your ROMs quickly and efficiently, without opening the lid. The ZERO INSERTION FORCE (ZIF) socket is located into the ROM Cartridge's position.

- Very simple to install. NO SOLDERING required. The ZIF (Zero Insertion Force) eliminates the possibility of damage to your ROM pins when inserting & extracting.
- The low profile of the socket allows unrestricted access to the Keyboard.
- All data and address lines are correctly terminated to ensure correct operation of suitable ROMs with the BBC micro. We also supply a purpose designed see-through storage container with anti-static lining, allowing you to store up to 12 ROMs, protecting them from mechanical and static damage.
- This versatile hardware solves the problem of running out of socket space. Simply lift the ROM from the ZIF & insert a different one (No pulling or pushing of Cartridges. It is a must for professionals and Hobbyists alike.)
- BBC, B+ and Master compatible.

ONLY **£18** (carr £3)

Low Profile CARTRIDGE SYSTEM

Complete System consists of: Low profile ROM Cartridge, Socket housing, Cable assembly, 5 labels and a library storage rack for the BBC B.

● Complete System	**£11**
● Spare Cartridges	**£2.75**
● Spare Rack	**£1.65**

ROM Cartridges for the BBC Master

Will accept the new larger Piggy Back ROMs like: Interword, Interbase, Quest, Conquest, etc

Twin **£9**; Quad **£14**

16K Disc Ram Module

(16K Sideways RAM Module)

Complete with such features as read and write protection, these new modules from Watford Electronics are ideal for the hobbyist, software developer and ROM collector.

Key points to note about this new addition to the Watford range of products are:

- Write protection (useful in a variety of circumstances)
- Compact construction
- No overheating or overloading problems.
- Free utilities disc supplied
- Can be used as a 16K PRINTER BUFFER.
- Ideal for profressional software development.
- Supplied with utilities software disc.

Only: **£29** (carr £2)

Optional Battery back-up fitted **£3**



ARIES CORNER

B-32 Shadow RAM Card

Like the BBC B+, the B32 provides 20k of shadow screen RAM and 12k of sideways RAM. Unlike the B+, the B32 has simple software commands which allow the user to reconfigure the RAM as 16k of shadow RAM and 16k of sideways RAM, or all 32k as sideways RAM.

With the B32, the programmer gets up to 28k of RAM available for Basic, Logo, Cobal, Forth, Lisp and BCPL programs in any screen mode. The business user gets extra memory for View, ViewSheet, Wordwise Plus, Interword and many other applications. For advanced applications, the scientific user gets access to a massive 47k of data storage using the Acorn approved ★FX call.

Sideways RAM enables you to load sideways ROM images from disc, allowing you to have a large library of sideways ROMs (subject to the copyright holder's permission) stored on disc. The B32's sideways RAM can also be used to extend any operating system buffer (such as th printer buffer) or to load tape programs into a disc system.

The B32 simply plugs into the 6502 processor socket on you BBC micro – no flying leads to connect and no soldering. Provision of the onboard ROM socket means that the Aries-B32 control ROM does not use up one of your existing ROM sockets.

- Recommended by Computer Concepts for use with their Inter series of ROMs.

Price: **£59** (carr. £3)

Aries B-12 Sideways ROM Board

The B-12 provides a total of twelve sideways ROM sockets (the four in the original machine are replaced by the twelve on the board), all fully accessible by the MOS sideways ROM system. In addition, there are two sockets for sideways RAM, giving up to 16k of RAM using 6264 static RAM chips.

If you do not have a B32 or B20, a small adaptor module (the Aries-B12C) is available at a nominal cost

Price:	Aries B-12	**£36**
	Aries B-12C	**£5**

ARIES B-488 IEEE-488 INTERFACE UNIT

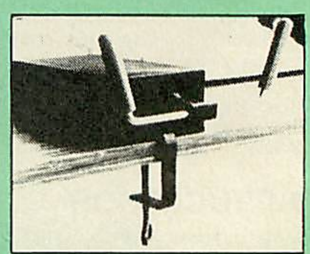
The Aries-B488 is an interface unit to enable the BBC micro to control and monitor IEEE-488 bus systems. The IEEE-488 bus (also known as the 'GPIB or 'HP IB') is the standard method of interconnecting programmable laboratory instruments and control equipment. Using the B488, up to 15 devices may be connected in a single high-speed data network.

£238 (Carr £3)

VOLTMACE JOYSTICKS

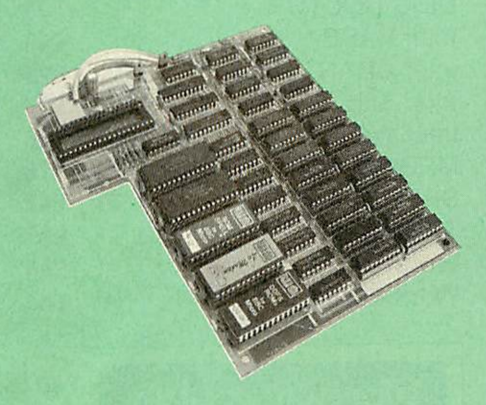
Delta 3B Single Joystick	**£10**
Delta 3B Twin Joysticks	**£15**
Delta 3C Joystick for Compact	**£10**
Delta 14B Single Joystick	**£11**
Delta 14B/1 Adaptor Module	**£12**
Transfer Software Disc-Tape	**£7**
Delta-Cat A mouse eliminator Joystick for the Archimedes	**£24**

Delta Base B



Analogue aircraft style yoke Joystick to run in the analogue port of the BBC B & Master 128 **£25**

ROM/RAM CARD



Watford Electronics announced the first ever commercial ROM board for the BBC micro, the Watford Electronics 13 ROM Socket Board 7 years ago. Following the success of this board, we have designed what probably represents the ultimate in expansion boards, the new Watford Electronics ROM/RAM board. This highly versatile and sophisticated board represents the latest in "2nd generation" sideways ROM technology for the BBC micro, designed to satisfy the serious BBC user.

- NO SOLDERING required to fit the board.
- NO User Port corruption (avoids problems with the mouse, modems, Eprom Programmers, etc.)
- Fully buffered for peace of mind.
- Compatible with BBC micros (not BBC+ or Master).
- Total number of ROMs increased from 4 to 8.
- Up to 8 banks of sideways RAM (dynamic).
- Option for 16k of battery backed CMOS RAM (CMOS RAM needs one ROM socket).
- Software Write protect for ALL RAM.
- Read protect for CMOS RAM (ALLEVIATES crashes during ROM development).
- Separate RAM write register (&FF30 to &FF3F).
- Automatic write to currently selected RAM socket for convenience.
- FREE utilities disc packed with software.
- Compatible with our DDFS board, 32k RAM Card, Delta Card, sideways ZIF, etc.
- Large printer buffer.
- UNIQUE fully implemented RAM FILING SYSTEM (similar to the popular Watford DFS).
- ROM to RAM load and save facilities.

The SFS (Silicon Filing System) can utilise up to the full 128k of RAM (with the SFS in any paged RAM) as a SILICON DISC. This behaves as a disc drive, with all the normal Watford DFS features (including OSWORD &7F for ROMSPELL, etc.) to provide an environment that looks like a disc but loads and saves MUCH faster.

The ROM-RAM Board plugs into the 6502 CPU socket. This leaves free all the existing ROM sockets, which can still be used normally.

Any ROM that can be plugged into the BBC micro's own ROM sockets may be used in the ROM-RAM Board.

The ROM-RAM Board is supplied with all ordered options fitted as standard. Upgrade kits (with full instructions) are available for all of the options, for later.

NTRODUCTORY PRICES:

- ROM/RAM card with 32k dynamic RAM £48
- ROM/RAM card with 64k dynamic RAM £65
- ROM/RAM card with a massive 128k dynamic RAM £109

(carriage on ROM-RAM Card £3)

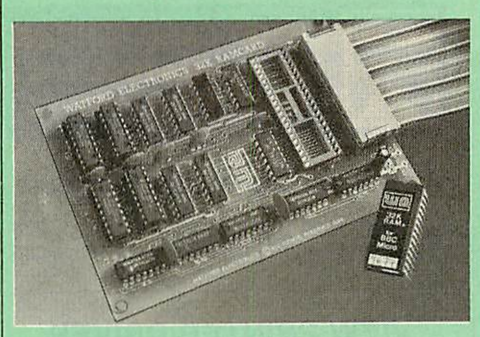
OPTIONAL EXTRAS:

- 16k plug-in Static RAM kit £9
- 16k Dynamic RAM for Upgrade £13
- Battery backup £3
- Read and Write protect switches ....£2 each

Complete ROM-RAM board
All options installed £115

P.S.
IS your existing ROM Board overflowing with ROMs? Do you need more Sideways RAM? Is your Board unreliable? Then upgrade to Watford, ROM/RAM Board and pay £5 less.

32K SHADOW RAM-Printer Buffer
Expansion Board



A MUST FOR WORD PROCESSING

Watford Electronics now brings you the latest state-of-the-art MEMORY EXPANSION BOARD for your BBC microcomputer. Don't throw away your BBC B for a BBC B Plus or BBC Master. Just plug the ribbon cable into the 6502 processor socket, and fit the compact board inside the computer. Immediately you will gain not 16k or even 20k, but a massive 32k of extra RAM!!!

- IMPROVE your WORD PROCESSING system, whether disc or cassette based. Don't wait for a slow printer – type in text while printing. TWO JOBS DONE SIMULTANEOUSLY and £100+ saved on a printer buffer.
- "VIEW" Wordprocessor users can now type in letters in 80 columns and have up to 28,000 bytes free – 5 times as much as normal.
- In WORDWISE (or WORDWISE-PLUS), preview in 80 columns with the full 24k of text in memory. This product is recommended as an ideal complement by Computer Concepts.
- Combine GOOD GRAPHICS and LONG PROGRAMS. Use the top 20k of the expansion RAM as the screen display memory, leaving all the standard BBC RAM free for programs. Benefit from MODE 0/1/2 graphics and 28k of program space.
- Use the FULL 32k or the bottom 12k of the expansion RAM as a PRINTER buffer for PARALLEL or SERIAL printers, sound channels, RS432 etc. Print large text files while running long graphics programs, and have all your buffer options available as well (*FX15,21,138, 145,ADVAL etc). Please note only a 12k printer buffer can be used with Wordwise or Wordwise-Plus, due to the way they are written.
- Unique facility to turn ROMs off and on again. Unlike all other ROM managers, this feature does not use 'unofficial' memory. Two bytes of normally user-inaccessible memory on the RAM card are used to ensure ROMs are disabled WHERE OTHER ROMS FAIL.

Only £59 (carr £3)
(Price includes a comprehensive manual and the ROM)

Acorn Speech Synthesizer package complete, for the BBC B Microcomputer
Special Offer £18

Watford Electronics are:

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BBC SOFTWARE'S Popular Educational Software

- Maths with a Story 1 (Disc). 4 primary level maths programs £11.25
- Maths with a Story 2 (Disc). 4 further maths programs. £11.25
- Picture Craft (Disc) 6-14 age group. Pack consists of flexible geometrical design & colouring programs. £17.00
- BONDING: Science (Disc) O-Level Chemistry program. £20.00
- ELECTROMAGNETIC SPECTRUM (8 Discs) O-Level program. £20.00
- ELECTRONICS IN ACTION (Disc) O-Level program. £19.95
- NEWTON & THE SPACE SHUTTLE (Disc) O-Level program. £20.00
- ECOLOGY (Disc) O-Level program. £20.00
- POLYMERS (Disc) O-Level program. £20.00
- Classification & Periodic Table O-Level. The suite is supplied with its own database of chemical elements which can be classified according to your own rule. £20.00
- FOOD & POPULATION (Disc) O-Level program. £20.00
- MICROTECHNOLOGY (Cassette) O-Level program. £11.25
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- Modem Master (Disc) £11.25
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Educational Software

FUN SCHOOL 2 – Red:
Under 6 yrs – 8 programs on Discs, Shape Snap, Find the Mole, Teddy Count, Write a letter, Colour Train, Pick a Letter, Spell a Word & Teddy Bears Picnic. £12.00

FUN SCHOOL 2 – Green:
6-8 yrs – Eight programs on Disc, Number Train, Shopping, Maths Maze, Treasure Hunt, Bounce, Packing Caterpillar, 3 Number jump £12.25

FUN SCHOOL 2 – Blue:
Over 8 yrs – Eight programs on Disc, Build a Bridge, Passage of Guardians, Unicorn, Logic Doors, Souvenirs, Code Boxes, Mystery Machine & Escape. £12.50

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  - Puncman 1 & 2 for 7 – 13 years £15
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VIEWPLOT Disc £20
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Watford's own Sophisticated VIEW PRINTER DRIVERS

Epson FX80 & Kaga KP (Disc) £8
Juki & Brother HR15 (Disc) £8

OFFICE MASTER



CASHBOOK – A complete "Stand Alone" accounting software package for the cash based sole trader/partnership business. It is designed to replace your existing cashbook system and will provide you with a computerised system complete to trial balance.

FINAL ACCOUNTS – Will take data prepared by the Cashbook module and produce a complete set of accounts as following: Trial Balance with inbuilt rounding routine; Notes to the accounts; VAT Summary; Profit & Loss A/C; Balance Sheet.

MAILIST – A very versatile program. Enables you to keep records of names and addresses and then print, examine, sort and find them, all with special selection techniques.

EASILEDGER – A management aid software tool designed to run alongside an existing accounting system. Essentially a Debit/Credit ledger system which can handle sales, purchase and nominal ledger routines to provide instant management information.

INVOICES & STATEMENTS – Greatly reduces the time and cost of preparing Invoices and Statements by storing essential information like customer names, addresses and account numbers. Has VAT routines and footer messages facility.

STOCK CONTROL – Allows you to enter stock received, stock out, summary of stock items and current holdings together with details of total cost, total stock to minimum level, units in stock ordering, quantity and supplier detail.

All this for only **£21** (Disc)

OFFICE MATE



- DATABASE
- BEEBCALC SPREADSHEET
- BEEBPLOT GRAPHICS

DATABASE – Set up a computerised card index system with powerful search facilities.

SPREADSHEET – Offers many calculation and editing features

BEEBPLOT – Provides visual representation from Spreadsheet data.

OFFICE MATE Only £10 (Disc)

MINI OFFICE II

DISC Version for BBC B & B+	£14.00
DISC Version for BBC Master	£16.00
DISC Version for the Compact	£18.00

(When ordering please specify for which Micro & 40 or 80 track Disc)

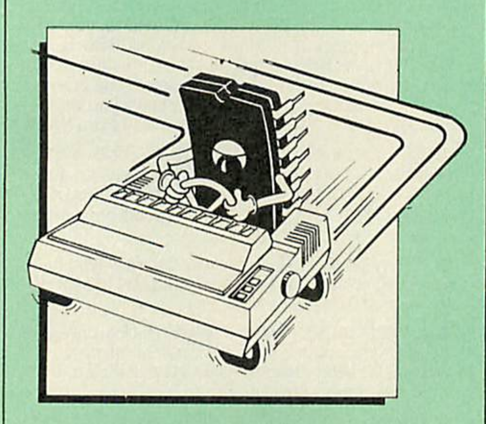


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Advanced Disc Toolkit £28
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VIEW PRINTER DRIVER ROM



View is a powerful word processor, but until now has seriously lacked in terms of printer support. With the launch of our Printer Driver ROM, which includes an extremely powerful and easy to use Printer Driver Generator, View users can find themselves in the realms of advanced word processing at only a small outlay.

The VPD extends View's printer command with a series of mnemonic commands. All standard highlight sequences are also supported. A large range of printers are supported by drivers contained within the ROM (the drivers can be downloaded and customised). Printers supported include: Epson's MX, RX, FX, LX, JX80 range, HI80, KP810/910, PW1080, JP101, HR15, M1009, GLP, Panasonic KX-P1081/2, JUKI 6100, etc.

Other printers are readily supported by defining a Printer Driver using the built-in Printer Driver Generator. The features mentioned below are available to both the built in Printer Drivers and user defined drivers (assuming the printer supports the features).

NLQ control, Underline, Bold, Proportional Spacing, Microspacing, Italic, Superscript, Subscript, Condensed, Enlarged, Double Strike, Set lines per inch numerically (e.g. LPI 6), Set characters per inch numerically (e.g. CPI 5), Select printer font, Select printer ribbon colour, Translation sequences, Emulation of BBC Character Set, Simple numeric expressions for certain operations, Full printer setup, Send control codes, Print prompt on screen, Redifinable Pad character, Pause for key press, Prompt to change daisywheel, and Execute ⋆ command when printing.

Other features include a very powerful on-screen preview, with bold, italic, underline, super/subscript, enlarged highlights, and a special printer driver to allow memory-based text to be previewed by View 1.4. Of course, View 1.4, 2.1 and 3.0 are all supported, as is Shadow RAM and 6502 Second Processors. The BBC B series and Master series of micros are supported. A comprehensive manual is supplied. All in all, a very professional product for the discerning user who wants power at their finger tips.

Price: Only £33

COMPUTER CONCEPT'S ROMS

COMMUNICATOR	£49
DISC DOCTOR	£28
Inter BASE	£49
Inter CHART	£25
Inter SHEET	£37
Inter WORD	£36
MEGA-3 ROM	£76
SPELL MASTER	£42
TERMI	£25
Wordwise	£24
Wordwise Plus	£40

Wordwise plus £40

We are giving away absolutely **FREE**, the superb Word-Aid ROM worth £24, with every WORDWISE PLUS package bought from us.

Word-Aid

The most comprehensive utilities ROM for Wordwise-Plus

Extend the power of your Wordwise Plus word processor with this most advanced ROM from Watford. By utilising the powerful Wordwise Plus programming language, WordAid provides a whole host of extra features, all accessed via a special new menu option. This ROM has been personally approved by Mr Charles Moir, the author of WORDWISE PLUS.

- Alphabetical sorting of names and addresses.
- Text transfer options.
- Chapter marker.
- Epson printer codes function key option.
- Search and display in preview mode.
- Embedded command removal.
- Print Multiple copies of a document.
- Multiple file options for print and preview.
- Address finder.
- Label printer.
- Mail-merger.
- Number/delete/renumber.
- Clear test-segment area.
- BBC B, B+ and Master compatible.

Only **£24**

(N.B. Word Aid requires a Disc interface in your Micro)

BOOK

The Complete Mouse User Guide to BBC Micro

This manual has been written to reveal the secrets of the mouse. It explains all the principles required by the hardware and associated software, and also example listings for inclusion into custom programs. The manual first details the basic principles of the mouse and a simple program which uses these principles. This information should be adequate for most applications. However, it is possible to improve the performance of the mouse by expanding on the principles already used in the software. This is again fully explained and an example program given.

It is possible to gain a full understanding of the mouse from this manual. For those not interested in exactly how the mouse functions, complete example programs are also included. These may be typed directly into the micro, without the need for any understanding of the hardware or software involved, enabling the mouse to be used for custom applications.

Price £5.95 (No VAT)

Example programs on Disc £4.95

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Archimedes 1st Step – Beginners Guide	£9.95
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BBC Basic Guide (Archimedes)	£19.95
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Viewstore User Guide	£10
Wordwise + A User Guide	£10.95
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Z88 Computing	£9.95
Z88 Magic	£14.95
Z88 Using Your	£9.95

Carriage on Books vary between £1 to £3.50, depending on their weight.

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1-2-3 Special Edition (QUE) – Using	£22.95
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8086/8088 Assembly Language Prog.	£13.50
8086/8088 Programming the	£17.95
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Wordperfect – Quick Reference V5	£8.95
WordStar Release 5.0 – Using	£19.95
Xerox Ventura Publishing – Inside	£27.95

THE COMPLETE BBC COMPUTER USER HANDBOOK

"Why has no-one written a book like this before? It's long overdue".

If you own a BBC-B, BBC B+, Electron, Master 128, Master Compact or Archimedes then this book is for you. It shows you how to get the most from your computer, and how to make the computer work for you. Although some sections are machine specific, most of the information, programs, hints and good solid experience are for the whole range of BBC machines. The general style and level means that both beginner and expert will feel satisfied with the quality and quantity of the material.

GENERAL – Uses and abuses of computers.

HARDWARE – How to design your own work station. Hardware additions (disc drives, ROMs, printers, 2nd processors, etc). DIY alterations.

HARDWARE RUNNING BBC-BASIC – All BBC machines are described with their differences. Compatibility between the various BBC machines. Networks. The Archimedes and its advantages.

GETTING ORGANISED – So that you keep track of your programs and control of your software. Setting up for easier programming sessions.

NEAT PROGRAMMING – Good style. Writing structured programs. Getting the best from BBC-BASIC, Graphics and screen displays. Speeding up programs. Saving space.

GENERAL PROGRAMMING TIPS AND HINTS – with a multitude of examples (eg input vetting, dealing with dates, blanking out function key messages, error trapping, disabling ESCAPE and BREAK, use of EOR with colour, etc).

DEBUGGING – Specific errors and how to handle them. How to test programs fully.

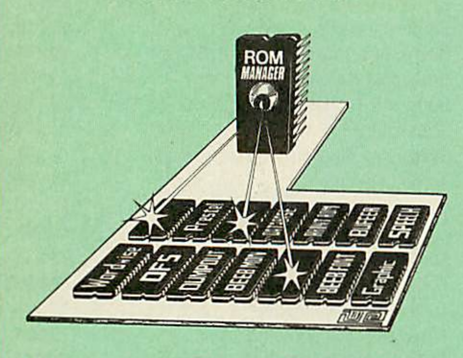
STANDARD PROGRAMS – Assessing word-processors, spread-sheets, databases, graphics packages, communications etc. How to customise them to your own requirements.

COMPUTERS AT HOME AND IN THE OFFICE – Introducing the computer to the office. Program protection. Computers and the law. Communications. Selling your own programs. 28 FULL CHAPTERS, elegantly written and extensively indexed. To dip into, consult, or read from cover to cover, again . . . and again . . . and again . . .

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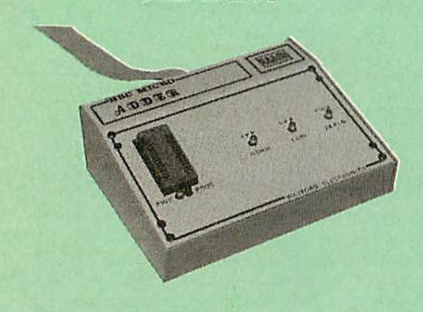
ROM MANAGER



Take control of your Sideways ROMs with ROM Manager. This powerful utility ROM gives you power over your sideways ROMs . Disable whole ROMs, send commands directly to named ROMs and many other powerful facilities.
"Provides comprehensive management of all your installed ROMs". (BEEBUG November '84.)

ONLY £20

ADDER



The only low cost EPROM Programmer for the BBC Micro that will program both the standard 21V and the new 12V5, 27128 EPROMS.
The Adder unit connects to the User Port and draws its power from there too. The EPROM is mounted in a top quality ZIF socket. There are no switches or controls as Adder is entirely software controlled.
The Adder software provides sophisticated facilities for programming EPROMs from a RAM image produced by loading disc files. The software is menu driven and designed for ease of use.
Features:

- Two ultra fast programming algorithms or standard slow algorithm.
- Supports standard 21V programming and newer 12.5 volt EPROMs. (Software switched).
- The RAM image to be programmed can be built up in many ways. Sections of image can be loaded separately. Part programming. Read EPROM. Edit data in memory.
- Automatic processing to handle a list of files to program into the EPROM.
- Automatic disc buffering to allow programming of 32K 27256 devices from a 32K file without extra effort.
- Verification gives detailed error list and checksums are maintained. There is also a blank check facility.
- Works with all standard filing systems. Generates header code for RFS ROMs to allow Basic programs etc. to be stored in EPROM. More than one file per ROM permitted.
- Programs the following EPROMs: 2516, 2716, 2532, 2732, 2764, 27128, & 27256.

£65 (£5 Carr)

TEX EPROM ERASERS

EPROMs need careful treatment if they are to survive their expected lifetime. Over erasure of EPROMs very rapidly turns them into ROMs!
The TEX erasers operate following the manufacturers specifications to give the maximum possible working life by not erasing too fast. We use these erasers for all our own erasing work.

- **ERASER EB** – Standard version erases up to 16 chips. **£28** (carr £3)
- **ERASER GT** – Deluxe version erases up to 18 chips. Has automatic safety cut-off to switch off the UV lamp when opened. **£30** (carr £3)
- Spare UV tubes. **£12**

Servisol Foam Cleaner

This 415Ml, king size multi-purpose foam cleaner spray is ideal for cleaning the Keyboard, Monitor, Disc Drive and your computer furniture surfaces. Simply spray on the surface to clean and wipe off with a clean cloth.

£2.50

Antistatic Aerosol Spray

Ideal for cleaning and preventing static build-up on TV/ Monitor Screens.

£2.50

Aerosol Dust Spray

This simple to use aerosol spray is ideal for removing Dust and Dirt deposits from the Keyboards and similar inaccessible places. **£3**

SPARES for BBC Micro

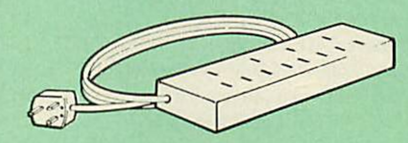
BBC Keyboard	£46	Speaker	£3
Master Keyboard	£62	Keyswitch	£1.50
UHF Modulator	£4	16MHz Crystal	£2
Speaker Grill	£1	17.734 MHz Xtal	£2
BBC Power Supply	£59	32.768MHz Xtal	£1
BBC B Refurbished Casing	£25	Master PSU	£59
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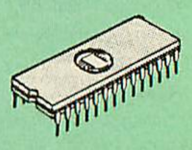
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ARIES PC AT 286



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EIGHT BITS

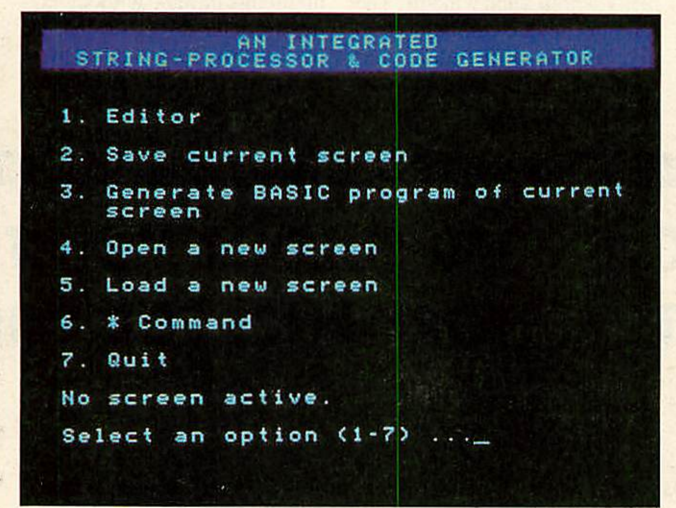
£10 TEXT SCREEN DESIGN

Edmund O'Shaughnessy from Fareham has encountered the problems many people face when writing a program to lay-out text screen displays. Lots of PRINT TAB statements and fiddling with exact positions make it very difficult to get the layout exactly right. What is really needed is a full-screen editor which converts a screen design into a few lines of Basic listing, and this is exactly what the program he has submitted to Eight Bits does. You run the program, type and position your text on screen exactly the way you want it, and then save it as a Basic program.

The program consists of two parts, the string processor (which is a full single-screen editor for editing strings of text) and the automatic program generator (which generates the necessary lines of Basic). Together these allow you to lay out text on the screen in the exact positions required and then automatically produce a Basic program that, when run, will faithfully reproduce the text again on screen.

When first run, a menu screen is displayed giving you a number of options. Before using the editor a new screen must be opened or a previously saved screen loaded. When opening a new screen, you first select an available screen mode, depending on the memory available, and the editor is entered automatically.

The editor screen is a two-dimensional grid of cells, text being entered as strings (limited in length to 218 characters) which can start at any particular cell position desired. Strings can therefore overlap one another. In the editor the cursor is positioned (using the cursor keys) at the start of the string to be entered and characters are then entered in the same way as for the BBC command line, by typing text and using the DELETE key to remove any mistakes. When a string has been entered, press the RETURN key and move on to the position of the next one to be entered. Full wordprocessor type editing of text has not been implemented for reasons of program size, but previously entered text can be edited by pressing CTRL and COPY at the first character of the string then using the DELETE and character keys to make any changes.



Because it is not possible to update the editor screen fast enough when changes are made, such as deleting a string, the screen is only updated when the TAB key is pressed. Pressing f0 toggles the status message, which tells you how many new strings are free to use, whether you are entering text, if there is something in the buffer or the system is busy, and the present screen co-ordinates of the cursor when text is not being entered.

A text buffer is maintained containing the last string entered, copied or deleted. It is therefore very simple to paste multiple copies of a string at different positions and to quickly move a string which is in the wrong place. Because of the way strings are held in memory when one is deleted, its memory is not released. To re-use this memory, either new text can be entered at its start position (found using CTRL-SHIFT-/ or the screen can be saved and reloaded, thereby freeing up all allocated but unused memory. When all the free memory has been used up, no more new strings can be added, although existing ones, including those that are empty, can still be edited.

Once a screen of text has been entered, it can be saved to disc for re-use later, and a Basic program can be generated that will faithfully reproduce the text screen when run. The Basic program is *SPOOLed to disc as an Ascii file consisting of line-numbered PRINT TAB statements corresponding to the text and positions of the strings entered. By typing *EXEC <filename> at the Basic command line, the spooled file can either be merged with an existing program or it can form a new program on its own.

The function keys (except f0) produce Ascii 129-137 for effects or user-defined characters in other modes.

At first glance, the program might look peculiar in places, but this is inevitable as the way Basic allocates memory space to strings has to be controlled to avoid the fatal 'No room' error occurring. Memory is left allocated when a string is deleted or all its characters are edited out, but can be reclaimed by saving and reloading the screen. The CLEAR statement is severe in its actions so it was essential to use GOTO, as stack items (such as return addresses) are completely erased by it.

The program has been written to run on a BBC model B without shadow memory and will also run on the Electron and Master series. The only areas of the program which are machine-dependent are the calculation of free memory and the error handling that assumes the stack is cleared when an error occurs. As it stands, the program has been designed to be as functionally useful as possible, and at the same time small enough to give a usable amount of free memory to work in. The program is about 9K long and running a rudimentary 'crunch'

utility over it would free about another 2K. Shadow memory can be used if you have it, by issuing *SHADOW before running the program (or including it in the program), and altering the last item in the data lines before FNoption. The third data item should be set to 0 if you have a shadow screen.

£5 SCREEN CENTRING

Eight Bits regular Phil Bender from Harold Wood has sent a brief utility which allows you to centre text in your programs. The clever thing here of course is that the program calculates whether a 20, 40 or 80-column display is in use, or one of the special screen modes such as those used in the *Interword* Rom. It is possible to write such a routine by reading the VDU variable in the Mos to determine which screen mode is in use, but this would not work with special modes, and would not even be transferrable across the 8-bit range of Acorn micros, never mind the Archimedes.

Instead the routine works by a very simple method, which determines the width of the screen by positioning the cursor at the first column, then backspacing into the last column of the previous line, and reading the character position with the POS variable. The complete routine, which centres the string text$ at row line% is

```
DEFPROC: centre(text$,line%)
PRINT  TAB(0,1);CHR$8;
PRINT  TAB((POS+1-LEN text$)
DIV  2,line%);text$
ENDPROC
```

This method has the additional advantage of also working correctly within a text window. The same technique can be used to give mode-independent text windows, or a close approximation of them, depending on the divisibility of the left and right parameters by two or four respectively. cw% is the width of a character in terms of mode 0 characters.

```
DEFPROCwindow(l%,b%,r%,t%)
LOCAL  cw%
PRINT TAB(0,1);CHR$8;
cw%=79 DIV POS
VDU 28,l% DIV cw%,b%,r% DIV
cw%,t%
ENDPROC
```

A useful application would be to give a text window down the side of a graphics screen. Whether the text would fit in is another matter.

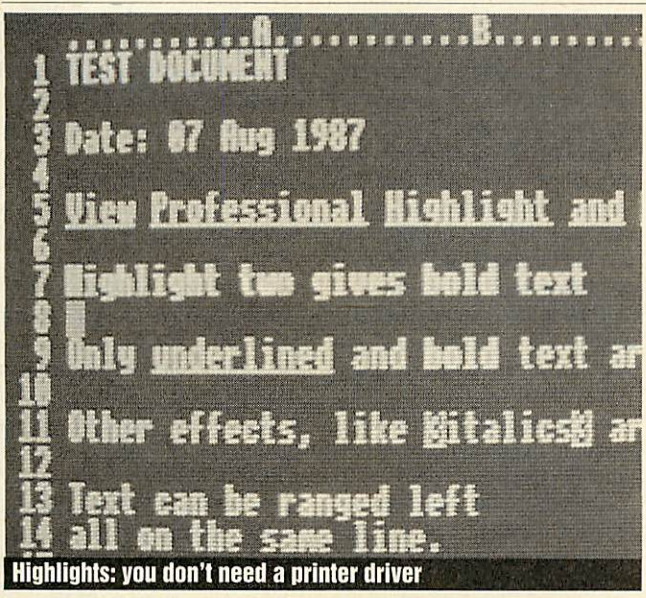
£5 DRIVERLESS VIEW

Mr D Hilton of Preston has sent further information on using the highlights in *View* without having a printer driver loaded. He has Electron *View*, and so these points apply to this version, but I think the same techniques can be used in BBC and Master *View*. Defining HT 1 as 1 and HT 2 as 15, then entering FUNC-H (equivalent to highlight 1) immediately followed by FUNC-J (equivalent to highlight 2) causes the printer to change to condensed mode.

Apparently, this is analogous to Basic's need to prefix codes below 32 with VDU 1 to ensure that they reach the printer. Of course you have to redefine HT 2 as code 18 and enter FUNC-H, FUNC-J again to return to normal mode.

Defining HT 2 as 27 and typing FUNC-H FUNC-J followed by another code works with:

- -*M producing Elite
- -*P restoring Pica
- -*W1 giving wide characters
- -*W0 cancelling them
- -* – 1 switching on underlining
- -* – 0 switching it off again



Highlights: you don't need a printer driver

and so on. Note that this works because HT 1 and HT 2 together generate the VDU codes 1 and 27, and the characters after these codes are in the normal printable range. This technique cannot be used with printer control codes which require any non-printable codes, for example setting line feed depth.

£10 PROFESSIONAL OUTLINING

Frequent contributor Jim McBride of Muirkirk shares with us an idea that he uses a lot since he moved from *View* to *View Professional* to do his work. It allows you to use *View Professional* as a simple outliner for documents and articles.

One important feature lacking in BBC and Archimedes wordprocessors is an outliner, a feature considered essential in the major IBM packages. Outliners allow you to think through ent before writing e you a screen plan · to while wordprocessing.

In a simple outliner, the main ideas are placed on the left of the screen, and the sub-headings are indented on the next line. Any expansion on a particular subset is further indented on the next line below that. This allows ideas to be set out in hierarchical order.

Where it really becomes a powerful tool is in the ability to let you rearrange the order of each of these 'idea families'. This is invaluable when thrashing out the plan for a large article or report, where you may want to move your ideas around several times before deciding on a final structure.

Because *View Professional* does not use rulers like other wordprocessors, but has unique text formatting facilities instead, it allows you to devise an outliner that fulfils all the above requirements. The principles should also apply to *Pipedream* on the Z88 and Archimedes.

Simply write your main heading and then after RETURN press TAB. You can now enter your sub-headings, and due to *View Professional*'s structure, they

will wordwrap at the correct indent. Pressing RETURN TAB again will allow you to go down another level in the hierarchical structure.

Taking a new line and pressing SHIFT TAB will allow you to step up levels and so start a new heading. The process can be repeated for each new idea.

Of course the real power lies in the ability to rearrange the order of ideas, and to do this, you use *View Professional's* facility for highlighting blocks of text. Simply mark the block of text containing the idea family by using *View Professional*'s mark function and the idea family will be highlighted in inverse video. Move the cursor onto the line where you wish to insert the idea family, creating a new line with the f6 key if you need it. Then by pressing SHIFT-f0, the idea family will jump to its new position and you can clear the highlights.

By this simple technique, you can easily move your ideas round the screen until you find an outline plan that suits.

A point to remember is that you must work in complete blocks the width of the screen.

```
Heading 1
   Sub Heading
         Sub-Sub Heading
         Sub-Sub Heading

Heading 2
   Sub Heading
         Sub-Sub Heading...
```

How to organise your ideas

If you attempt to move a small section such as an indented subheading, this will cause severe formatting problems. Once the outline is finished, you just start writing immediately below it. You can always flick back to the outline by holding down CTRL and pressing the up arrow key. Once you have studied the outline, you can again flick back to where you left off writing by holding down CTRL and pressing the down arrow key. One feature of PC outliners is that they allow you to 'collapse' and 'expand' the outline so that you can view just the headings, or just the headings and first level of subheadings and so on.

This is not directly achievable in *View Professional*, but you can separate out the parts you want to see from the parts you don't by use of the \W command, to make, the second column 79 characters wide.

This means that only the contents of columns one and two are shown on screen, the other columns being confined offscreen to the right.

Jim finds this a much tidier and quicker way of creating plans for articles than obscure scribblings on bits of paper.

£5 SHADOW RAM NOTE

John Barker from Bath has sent me a contribution concerning the use of shadow Ram on the Master series, which he says, and I must agree with him, is not terribly clearly documented in Volume 1 of the *Master Series Reference Manual*.

John started to look at this after using the program in the December 1989 edition in which a knitting pattern is derived from a previously prepared screen picture file. The file is scanned with POINT(X,Y) at an interval representing the width or height of the stitches, and the colours are sent directly to a printer in the form of a knitting pattern. The scan is done twice. During the first scan, Ascii characters representing the colours of the stitches are printed to form a coarse reproduction of the origi-

nal picture. During the second scan, a text 'recipe', giving the numbers and colours of the stitches in each row, is printed.

John's daughter has a Master 128, and he wanted to produce output on the screen in the 'recipe' form, for copying into a knitting machine, and this necessitated an understanding of the way shadow Ram works.

It is well-known that the 'main' and 'shadow' Ram areas can hold two nearly identical screens which can be updated and displayed alternately to produce animation effects. It is also possible to have two quite different screens. For the purposes of illustration, imagine that the picture file is to be loaded into the shadow Ram and that the knitting 'recipe' is to appear on the main screen. Prompts are directed to appear on either screen depending on which is displayed at the time.

First, the star commands. *FX112 selects the memory bank to which VDU commands will apply. That means PLOT, POINT, MOVE, DRAW and so on.

It also means CLS/CLG commands, and text characters generated either by PRINT statements or from keyboard input, but not direct screen access using indirection operators or machine code instructions. *FX112,1 selects the 'main' screen memory, *FX112,2 selects the 'shadow' screen memory.

Other commands, those which use direct screen access as mentioned above, are always and only directed to main Ram. However, it is possible to page the shadow Ram into the main memory map (the main Ram at this point goes into 'limbo'), so that files can be loaded or other direct memory accesses can be made, so

```
*FX108 2
*LOAD picture 3000
*FX108 1
```

switches shadow Ram to main Ram, loads a picture in, and switches back.

The net effect of these three commands is to load a picture into shadow Ram without losing the contents of main Ram.

Note that neither of the previous commands determine which screen Ram is actually being displayed on the monitor. This is set by *FX113 where *FX113,1 displays the main Ram on screen, and *FX113,2 displays the shadow Ram.

Note that the main and shadow screens are not totally independent. In particular they both have the same screen mode and palette, the cursors of each are joined, and they always scroll together.

In the knitting pattern program, John found that when the picture on the shadow screen had its background colour changed with VDU 19, then the background on the 'other' screen similarly changed.

Also, when the text screen becomes full and scrolls, so does the knitting pattern picture.

The best way to avoid this is to prevent the output from scrolling, which can be achieved with:

```
IF VPOS=31 THEN REPEAT UNTIL GET=32 : CLS
```

after each line of text is output. The REPEAT loop allows you to copy all the information from the screen before it disappears. Pressing the spacebar clears the screen, and fresh text appears.

That's all for this month. Please carry on sending your BBC/Electron and Master application-based hints and tips to: David Atherton, Eight Bits, BBC Acorn User, 20-26 Brunswick Place, London N1 6DJ.

LASER • DIRECT



THE *FASTEST* ARCHIMEDES LASER PRINTER

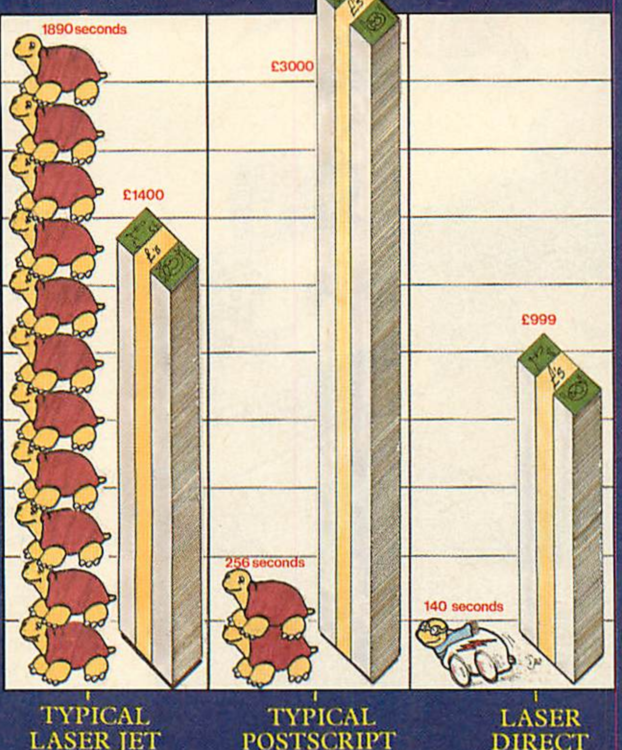
The LaserDirect consists of an interface board, our RISC OS printer driver software, and a special version of the 300 dpi Qume six page per minute printer. Because the board drives the printer 'engine' directly, not only does this save a complex controller board usually resident in the printer, but it also means it prints very much faster than traditional printers. The speed is a combined result of our optimised RISC OS printer driver, the RISC processor and the unique 2Mbit/second data link to the printer. One other significant advantage is that the LaserDirect uses the Acorn outline fonts installed in the machine, so guaranteeing all fonts seen on screen will print - no need to make sure the fonts match those installed in your PostScript printer.

Special features - Software on board means it is always available and can be automatically installed on startup - no loading from disc • The LaserDirect offers special links to other Computer Concepts software. For example, when combined with the new Scan-Light Plus software, it offers a direct scan to print facility. It can scan and print a full A4 page in under a minute. • A PostScript compatible interpreter will also be available, turning the Archimedes and LaserDirect printer into a very fast PostScript compatble printer (but using the Acorn outline fonts).

LaserDirect Qume (incl. printer, interface board, and software) £999 +VAT & carriage

The result is a printer whose quality is the same or better than traditional lasers, that can use all RISC OS outline fonts, that is faster than traditional printers, and costs less.

The Qume Liquid Crystal Printer is not technically a laser printer. Instead of having a laser and spinning mirror arrangement, this printer has a conventional light source shining through a liquid crystal shutter array. The result is fewer moving parts, a lower cost and a more reliable printer. It also occupies a very small amount of desk space—42cm by 42cm, no more than a standard dot-matrix.



Compatible with all applications that use RISC OS printer drivers, e.g. Draw, Paint, Pipedream, ADP, Impression etc.

Graph shows time taken to print a typical 10 page document with a selection of different fonts, together with typical price.

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WARRIOR TANK

This game, co-written by **STUART CUPIT** and **SIMON CRUSE**, will get your adrenalin flowing and turn you on to wireframe graphics



If fast arcade action gives you a thrill, *Warrior Tank* is a *Battle Tank* type game using 3D vector graphics to portray a first person view from your tank. The idea of this game is to battle against enemy tanks and to survive as long as you can. You start with three lives, and lose a life each time you are hit by a shell. You are armed with a shell firing cannon and a cannon sighting system. You also have a radar display to aid in navigation.

You are opposed by a number of tanks and 'bonus' ships whose only objective is to blow you off the battle area.

Scattered around the game arena are a number of indestructible objects (towers and pyramids) and these can neither be destroyed nor passed through. Tanks simply bounce off these objects, and shells explode on contact with them.

As you start each level the number of enemy tanks is equal to the level number you are on. On level 5 there are five tanks to start with, on level 200 there are 200!

'Bonus' ships appear at random time intervals. They descend from the sky, and once landed they fire a sweeping volley of shots in a circle around them. If they are not destroyed they fly off again once the volley is finished. If one lands on you that's the end for you! If the 'bonus' ship is destroyed while on the ground you may rise a level at once (it is possible for enemy tanks to kill either each other or bonus ships, and bonus ships can kill enemy tanks or other bonus ships...) If you don't meet a 'bonus' ship you will have to destroy all the tanks in the arena to rise a level.

'Rising' a level is depicted by your tank rising off the ground and flying upward until you reach your destination. This seems a little strange at first, but you will soon get used to what is going on.

Explosions occur when a shell hits an object, or if the bonus craft lands on another object. If a shell contacts a tank or bonus craft both shell and vehicle explode, throwing out a shower of debris (in the

form of several polygon facets).

Shells also explode at the perimeter of the arena or on contact with towers, pyramids, or other shells.

You can navigate your way around the arena with the help of a radar. This can also help vehicles. The white dot in the centre of the radar is your tank, everything else 'moves around' this point. Red dots show the position of enemy tanks, green dots are pyramids or towers, cyan dots are shells and dark blue dots are debris. Finally, twinkling dots are bonus craft. The initial screen shows how the tank is controlled.

The opening screen shows you how to control the tank

Source code

Warrior Tank needs 160K screen memory, and about 300K application space free before execution to run.

When run the title screen should appear with a message asking you to wait for a moment to allow the code to be assembled. After a couple of seconds you will be presented with the message 'Press any key to play'.

The game need only assemble once, at the start of each load in. It does not need to assemble between games. If you lose all three of your lives, you will be presented with the message 'GAME OVER', and you will also be told which level you finished on. You are then returned to the title screen, where, if you have beaten the highest score of the day, you may enter your name.

The game uses a number of procedures and variables. A few of the more important ones are shown in table 1.

Proc_ass	used to organise the code assembly
Proc_titles	displays the title page and message
Proc_object_set_up	sets up battle arena for next game
Proc_table_set_up	defines all memory 'look up' tables
Proc_swop	switches between screen banks
lives%	initial number of lives
Slevel%	level at which game starts
highlevel	highest level of the day
screen%	holds which screen bank is being used
object_length%	size of each object buffer
max_objects%	maximum number of objects possible
frame	count for delaying between levels
sign	direction of flight between levels
name$	player who reached the highest level

Table 1. Procedures and variables

The program works by using a large 'bin', big enough to hold 'max_objects%' different objects. The bin is used as a buffer, divided up into chunks large enough to hold each object, into which the objects are placed in order for them to become involved in the game. The information held in the bin describes the characteristics of each object. This means that for a typical object the bin holds:

- The type of object, or a null object
- x, y, z co-ordinates of the centre of the object
- The orientation of the object about all axes
- Constant offset angle for an object
- Velocity vectors for the object
- Spin speeds about any axis
- Frame count
- Offensive/defensive flag
- Approximate size of the object

There is also a flag, only relevant to one type of object. If the first word of the object's information is a zero, then it has been killed and the space can be used to hold the next object added to the bin.

Each frame the program scans through the bin, picking out the active objects (those for which the first word is non-zero). It then offsets each object in turn relative to your position.

The offset involves the subtraction of your tank's co-ordinates from all the other objects' co-ordinates, placing all objects relative to you. The central co-ordinates of each object are then rotated around you, you being the origin, which puts everything into the correct viewing frame.

The objects 'in front of you' are then displayed. An object is considered to be in front of you if its co-ordinates (now relative to you) are positive and within an 'observable' range. Each object is displayed as follows:

Warrior Tank references a table containing the co-ordinates of the vertices for this object. These co-ordinates are then rotated and offset to the object's central point. The new x and y co-ordinates are scaled using a perspective routine.

The resultant values are stored in a temporary buffer ready for the next stage.

Rotating the co-ordinates by any number of degree 'units' around the origin is performed by three routines, one for each axis. The equations used are variations on the following:

$$x = x*\sin(angle) + y*\cos(angle)$$
$$y = x*\cos(angle) - y*\sin(angle)$$

You can replace x or y with z to rotate about the other axis. The 'sin(angle)' and 'cos(angle)' are stored in a look-up table, setup in Basic at the beginning, to save time on calculations in the game. The perspective routine works using a large look-up table. The values held correspond to the reciprocal of the distance. As these values all prove to be less than one (integers only can be stored in memory), they are stored scaled up by a factor of 4096. The value pulled from the table by the routine depends on the z value of the co-ordinate.

The x and y co-ordinates are then multiplied by this value and the '4096' scale factor is then taken out by rolling the result right 12 places. Once all the vertices are buffered, the actual display routines operate on the data.

Although objects appear on the screen as white-lined images, a small complication occurs during their display. This is due to the ability of certain objects to fade out. A fading object is 'flagged' and the routine picks up on this flag and alters the display colour before any facets are put to screen.

The display routine loops through the 'facet' data pulling the relevant co-ordinates from the buffer as necessary. Each x,y pair of co-ordinates is offset to the centre of the screen, and once three pairs of co-ordinates are recalled and offset a hidden line removal algorithm is used upon them. This prevents unseen facets being drawn. The algorithm uses a variation on the cross-product equations found in any maths book (see figure 1).

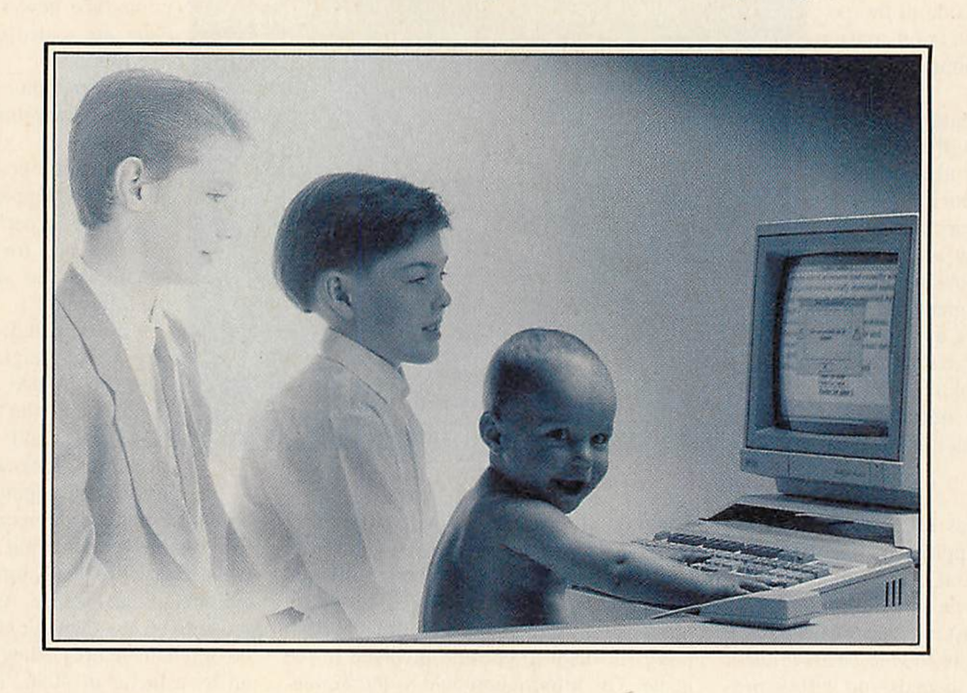
Let's take three pairs of co-ordinates – Xa,Ya,Xb,Yb,Xc,Yc

Value=((Xa-Xb)*(Ya-Yc))-((Xa-Xc)*(Ya-Yb))

This works by calculating a vector perpendicular to the plane of the facet. The points are described in the facet data in a clockwise order, as though looking from the outside of the object. This means that the perpendicular vector points outwards (away from the object). Only the z component of the vector is calculated for speed and the sign of this vector 'Value' above is used to determine whether the facet is visible.

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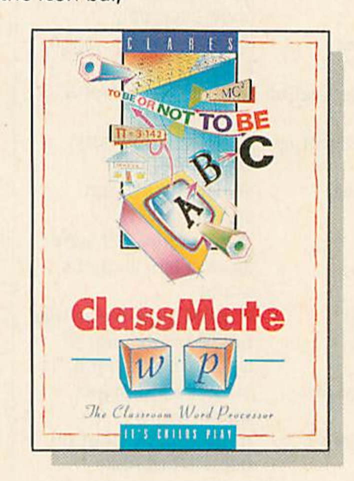
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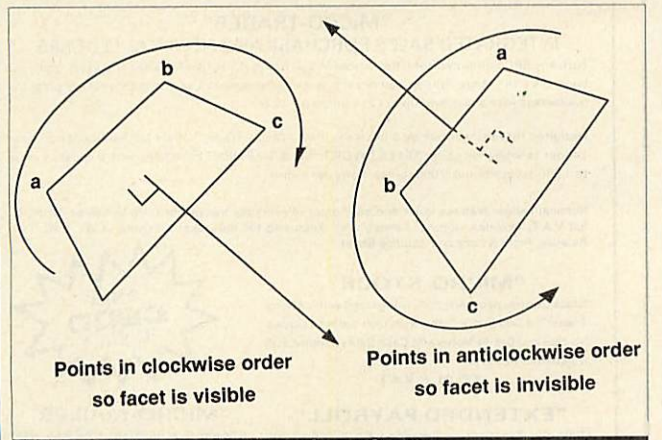


Figure 1. Removing hidden polygon facets

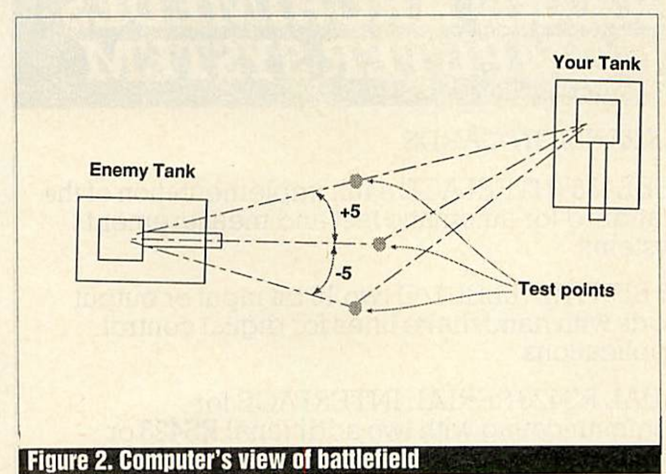


Figure 2. Computer's view of battlefield

If proven to be a visible facet the 'in-built' line drawing routines are used to plot the facet to the screen. Once all facets are dealt with, the program starts again with the next object.

The next part of *Warrior Tank* controls the actual gameplay. It effectively manoeuvres all the objects around the battle field, performs 'hit detection' and decision making for the tanks.

All objects have x, y, z velocity vectors which are added to their central co-ordinates every frame. Thus to move an object around the battlefield, in any speed and direction, the program simply places the relevant values into these vectors. For example shells, debris, tanks and so on, all use these vectors to move about the battle area. Stationary objects, such as towers and pyramids, also use these vectors, however their values are always zero.

A similar method is used to control the rotation of any object. By placing values into the rotation vectors an object can be spun about any one or more of its three axes. For example tumbling shells and falling debris spin at 'random' velocities. These vectors are added to the current angles of the spinning object. A rotating tank is spun in this manner by a specific angle by the use of a frame count system. This means that if the tank has to spin by 45 'units' its y axis rotation vector is set to five 'units' and a frame count set up for nine frames.

Hit detection uses an approximate object size to calculate whether one object has collided with another. Within each object's data is stored a 'size' value.

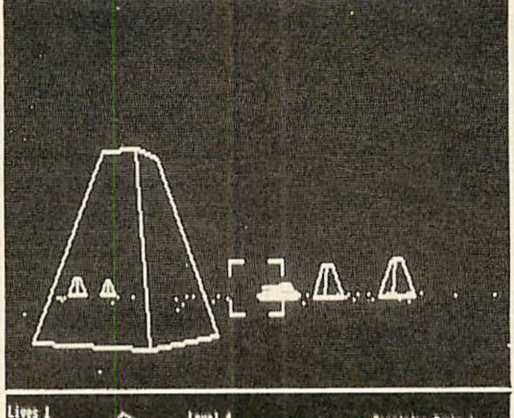
If the sum of the 'sizes' of two objects is greater than the actual distance between them, they are considered to have collided. The distance between two objects is calculated from Pythagoras' equation. However, due to the all-round need for speed, square rooting is eliminated from this equation. This is achieved by storing the 'size' value of each object squared.

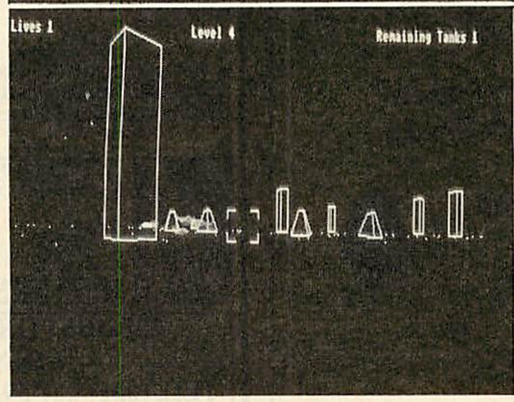
The driving routines for the tanks decide whether a tank should, according to a weighted probability, attack or perform an evasive manoeuvre.

In attack mode, the tank has to aim its gun at you, before firing a shell or number of shells. This achieved by rotating the tank according to the following rules:

Three points in front of the tank are calculated, all at the same distance from its centre. The first point is directly in front, the second five rotation 'units' to the left and the third five to the right. The distance between each of these points and you is then calculated. If the point in front of the tank is closest the tank will fire, otherwise it turns in the direction of the closest side point (see figure 2).

This method proves to be extremely fast and accurate, thus providing a formidable opponent. Evasive action simply involves the tank turning by a random number of 'units' (up to a half revolution) and then proceeding to drive for a random distance.





On completion of a manoeuvre or attack the decision is taken again to 'run or fight', and this process is repeated for every tank.

A radar is provided in the top left-hand corner of the screen which shows the current state of the battle field. This is achieved by simply scaling the central points of all the objects on the playing area, once they have been rotated and offset to your position. Then they are plotted as different coloured dots for different objects.

To give a better 'feel' of movement about the battle area, a routine which places points on the ground has been included. It does this by holding an array of points which are offset as you move and rotated proportionally, before being given perspective and displayed.

Your gun sights have two states, on-target and off-target. When on-target the routine simply draws the sights in a set of 'cross-hairs'. When off-target, the sights become a box outline to aid the player in aiming. The sights are defined as on-target if the central x co-ordinate of an enemy is within a predefined area after subjection to perspective. Otherwise the sights are off-target.

The information at the top of the screen is printed using Basic, for simplicity, every frame. Sound is provided by output of a 'percussion' effect upon the detection of an explosion and also on the occurrence of a shot being fired. The sound is varied in volume according to the type of effect required.

To achieve smooth flicker-free animation, double buffering is used. This involves the use of two separate screens to present the display. While one screen is displayed the other can be cleared and drawn to. To stop screen flicker a Wait command is issued before the screens are swapped.

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BLOB HUNTING

It's surprising how many image analysis problems come down to locating and counting 'blobs' – and that's not always easy to do, as DAVID KNELL explains

In this article, we're going to examine 'count-the-blob' image analysis problems: those in which the image you're analysing consists of a set of amorphous shapes. Although this sounds rather limited, it is applicable to a surprisingly wide variety of problems. One application for this type of analysis is counting bacterial colonies on petri dishes, where it allows scientists to make precise measurements of the number of bacteria present by finding the total area of the colonies on the dish.

This is an onerous task to perform by hand: colonies may be of arbitrary shape and area, and finding their area involves overlaying a grid and counting the squares containing bacteria. This sort of image analysis is also fundamental to the production of many foods in this country, which are checked for contamination by attempting to grow bacteria from samples of the food, and rejected if too many grow. Milk, for instance, is checked in this manner.

The automated solution is superior to the manual one in a number of ways. Firstly, the computer is entirely objective: it will not ignore a colony for subjective reasons ('it doesn't look right') and it will provide repeatable and accurate answers. It's also a lot faster: what may take a human several minutes can be performed by a computer in a matter of seconds.

So let's take a look at what's involved in performing a typical image analysis task. Firstly, the sample to be analysed has to be prepared. This is crucial to ensuring the correctness of the subsequent analysis. If samples are prepared carelessly, then the same sample may well produce different answers from the system depending upon how it was prepared.

Supposing that you're attempting to grow samples from food, then it's important that the bacteria should have the same time to grow and that they should be grown at the same temperature, otherwise the areas of the colonies produced will vary. Secondly, you've got to capture an image of the sample. Again, consistency is required: same lighting level, same camera, same exposure, same distance from the sample. Varying any of these will change the image produced for a sample, and this will prejudice the final result. You've also got to threshold the image, as was described last month, in order to produce a binary image which is easy to analyse. The thresholds used must be kept constant, as the apparent size of an object varies depending on the threshold used (see figure 1).

Finally, you've got to analyse the image. This analysis will consist of measuring some parameters describing each blob found, such as area and perimeter. It's then up to you to make some sense of these.

Sample preparation is not going to be examined further in this article. The principles are as laid out above, and the practice is dependent upon the problem being tackled. The same goes for image capture.

Accompanying this article is a program to perform image analysis. It allows measurements to be taken of blobs in an image, for the blobs to be either accepted or rejected depending upon these measurements, and for you to be able to calculate your own results from the parameters measured.

The program scans the image, searching for objects (blobs). When an object is detected, a set of points describing its edge are found and the object is deleted from the image, to prevent its being found again. A number of measurements are made on the object, and, based upon these measurements, the object may be accepted or rejected. If accepted, the measurements describing the object are written to a results file.

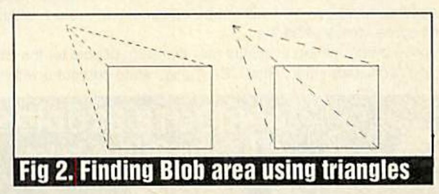


Fig 2. Finding Blob area using triangles

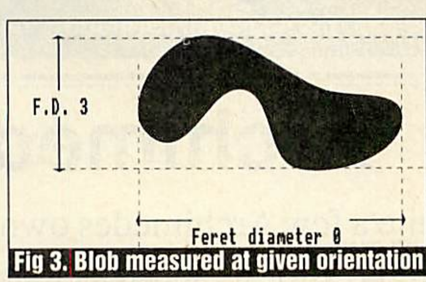


Fig 3. Blob measured at given orientation

The first procedure called in the program is PROCFindBlobs, which searches through the image for blobs to analyse. It starts at (0, 0), and searches row by row until the edge of a blob is found (marked by a zero to one transition in the image).

It then calls PROCProcessBlob, which is responsible for dealing with the blob found. PROCFindContour follows pixels around the edge of the blob until it returns to the start (signified by it finding both the first and second pixels again).

The method is quite neat, and relies on following the contour in a clockwise direction. Suppose you've just moved from one pixel to the next along the contour, then look over your left shoulder and sweep your head round clockwise (the way that seems natural!) until you see a set pixel. That pixel is then the next on the contour, so you move to it and repeat the process. Provided

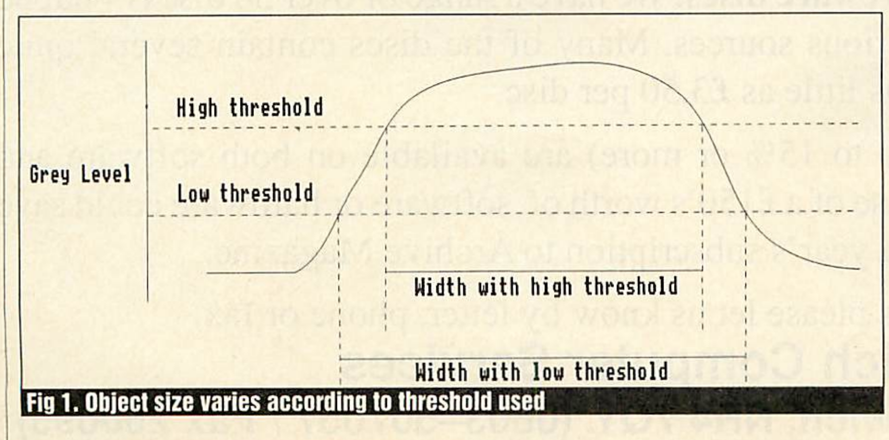


Fig 1. Object size varies according to threshold used

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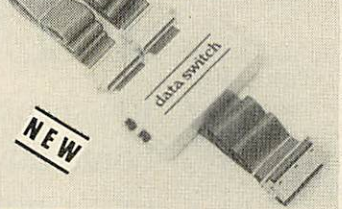
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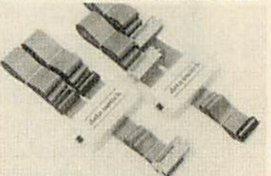


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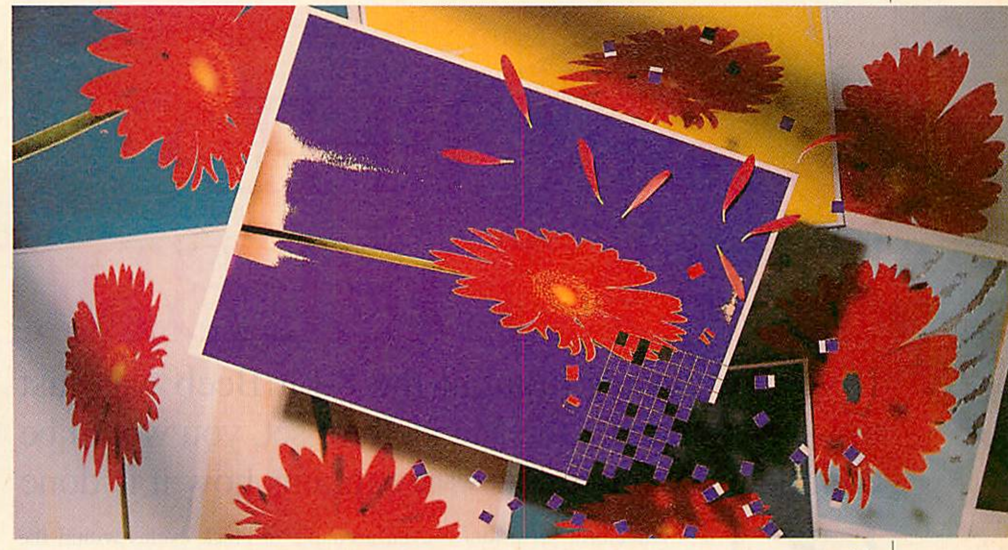
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you start off going clockwise around the contour, the procedure is guaranteed to work, and you can start off going clockwise because you start at the top left-hand corner of the object. Incidentally, this is my solution to last month's problem.

Having found the contour of the blob, you can safely delete it from the image, and this is performed by PROCRemoveBlob, which implements a standard fill algorithm except that it's used to remove! Now you've got the contour, you can make various measurements on your blob

The first one made is that of the blob's area (performed by FNBlobArea), and this is done using a method based on triangles (figure 2). You should also measure its perimeter (in FNBlobPerimeter), and this can be done straightforwardly by adding the lengths of the lines which make up its edge.

Next, eight Feret diameters of the blob are measured. A Feret diameter isn't the width of a rabbit-hunting polecat, but the width of your blob measured at a given orientation. It gives you the measurements which you'd obtain if you measured the blob using calipers at 22.5 degree intervals (see figure 3).

The longest and shortest of these diameters are found , as are the diameters perpendicular to these. Finally, the centre of gravity of the blob is found – this isn't so much a way of characterising the blob as of giving its position on the image.

All of this activity is co-ordinated by PROCProcessBlob, which relies on a set of functions to perform most of the calculations for it. It then allows the calculation of a couple of user expressions based on these measured parameters, and tests to see if the object is to be accepted, and writes it to the results file if so.

The user functions are specified in PROCInit, which sets up a pair of expressions, userexp1$ and userexp2$, which are used to calculate variables user1 and user2.

The expressions may draw on any of the measurements made by PROCProcessBlob as the results of these are stored in variables: see figure 4 for the list. PROCInit also defines acceptexp1$ and acceptexp2$, both of which must evaluate to TRUE if the object is to be entered into the results table.

So how can you use all this power? The program generates a few example shapes on screen: a circle, a couple of squares and a couple of triangles, one large and one small. Let's see how to set up the program to tot up the areas of all of these shapes, to detect which is which and to ignore the small triangle (treat it as noise).

Finding the total area is straightforward: set userexp1$ to 'user1+area ', which just adds the area of the object found to a running total. The User1 column in the results file gives the cumulative area, so the last value is the total area of objects found.

Differentiating between different shapes of object is trickier. First, define a 'shape factor', which tells you how close the object is to being a circle. You can calculate the radius of a circle as its perimeter divided by 2*PI, and its area as PI*radius^2.

For the shape factor, you calculate the expected area of the object from its perimeter and divide this into the actual area: the result is a number from zero to one, with one indicating a perfect circle and zero something which is distinctly non-circular.

So enter 'area/(PI*(perim/(2*PI))^2)' into userexp1$. To differentiate between triangles and squares, you calculate the aspect ratio of the shape: enter 'shortp/short' into userexp2$. (Exercise: why shortp/short and not long/longp or even long/short?)

Running the program with these settings produces the results file in figure 5: you can detect the circle as its shape factor is 0.90 (it's not 1.00 due to the image being divided into pixels), and the triangles and squares have aspect ratios of about 2.0 and 1.0 respectively.

Suppose you now want to ignore the small triangle (assume it's a speck of dust or some other form of noise.)

One obvious way of doing this is by only allowing objects with areas greater than a certain value, say 500. So, to remove the small triangle from your analysis, set acceptexp1$ to 'area>500'.

Re-running the program gives the same results, but the small triangle is excluded. Note that the user expressions are calculated after the acceptance conditions, and will not be executed if the acceptance conditions aren't met.

From the few measurements that you have made on the blobs, then, it is possible to derive a wide variety of information.

Next month we look at problems that arise with this type of analysis, how they may be overcome and consider other methods for analysing images.

```
area      Area of object
perim     Perimeter of object
cogx      X co-ordinate of centre of gravity of object
cogy      Y co-ordinate of same
feret()   Array (0..7) of Feret diameters
short     Shortest Feret diameter measured
shortp    Feret diameter perpendicular to short
long      Longest Feret diameter measured
longp     Feret diameter perpendicular to long
user1     User variables set as a result of evaluating
user2     userexp1$ and userexp2$. Zero at the start of a run.
```

Fig 4. Variables available for use in user calculations

```
User1     = area/(PI*(perim/(2*PI))^2)
User2     = shortp/short
Accept 1 = TRUE
Accept 2 = TRUE
```

Area	Perim	COG:X	COG:Y	Short	Long	ShortP	LongP	User1	User2
====	=====	=====	=====	=====	====	======	=====	=====	=====
20000.00	682.84	104.68	159.32	141.42	282.84	282.84	141.42	0.54	2.00
10000.00	400.00	350.00	74.00	100.00	141.42	100.00	141.42	0.79	1.00
200.00	68.28	164.80	115.20	14.14	28.28	28.28	14.14	0.54	2.00
11192.00	394.68	298.46	298.46	116.00	122.48	120.00	122.48	0.90	1.03
5000.00	285.19	149.54	349.38	70.71	100.00	73.54	100.00	0.77	1.04

Run took 34.2 secs

Fig 5. Example of output produced by the blob analysis program

JOIN THE MANDELBROT SET

If you've always thought the 8-bit Beeb was just too slow to handle the Mandelbrot set, you would be completely wrong. **JAMES WARD** explains how it is done

The Mandelbrot set offers great potential for exploration but, due to the intense calculation required, a great deal of waiting is involved. This program, inspired by the fast Archimedes version, is intended to produce plots in a fairly short time on a standard BBC micro.

With an 8-bit machine you obviously have to set your sights a bit lower but you can still manage a respectable speed.

The program detailed in this article will produce the Mandelbrot set in just over seven minutes. This program offers other advantages including 36 colours (without using the Graphics Extension Rom), proportional grey-scale printer-dumps and an efficient screen compression routine to save disc space.

The program also incorporates a cursor for selecting the area of the set you wish to investigate, removing the need for calculators and scraps of paper.

The arithmetic routines in the assembler work with 32-bit fixed-point numbers. Floating point routines would take longer to execute and would be inefficient in this application. The crucial element in the program is the multiplication routine. This is the bit that slows things down. Removing even a couple of clock cycles within the main loop can produce surprising increases in speed. As it stands the program could be improved but some compromise has to be made between speed and program size.

Listing 1	B.ManAssm
Listing 2	B.ManDump
Listing 3	B.ManGenr
Listing 4	B.ComPres
Listing 5	B.ManFast

Note : ADFS users will need to create the directories $.C and $.M to be able to use these programs

Table 1 Recommended filenames

The assembler may look unnecessarily complicated and long but it is written for speed. Fast programs tend to occupy more memory while shorter ones are often very slow. The multiplication routine could, for example, be made much faster by removing the loop and spreading the code out, repeating it 32 times. This would make the routine huge but it would run faster. It is important to point out that, in the pursuit of speed, the program writes directly to screen memory and assumes that it is located at &3000 for mode 2 graphics.

The package as a whole consists of five separate listings. These will produce a further five files on disc. Ideally, you should start with a blank disc and type in the listings in order, saving each one under the correct name. It is important to use the correct filenames as the programs may not work without them. The recommended filenames are given in table 1.

Before the main program can be used some of the other programs must be run. These create files on the disc which will be used later. Once again, it is important to do things in order. To set up the disc you should type the following:

```
CHAIN 'B.ComPres'
```

This produces two files called LDFRM and SVFRM. These are the screen compression routines.

```
CHAIN 'B.ManDump'
```

produces a file called M.ManDump, a screendump.

```
CHAIN 'B.ManGenr'
```

generates the initial Mandelbrot set, which is used by the main program every time it is run. The program takes about seven minutes to run and writes a file called 'S.ManBrot' when it has finished.

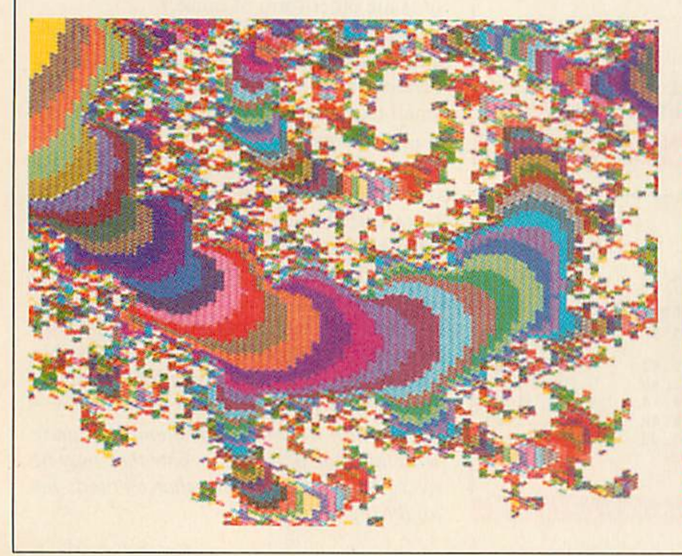
Next, type in:

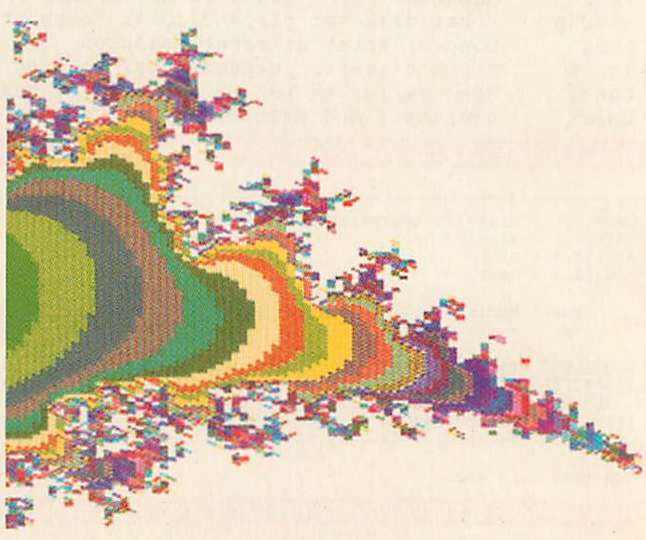
```
PAGE = &2100
CHAIN 'B.ManAssm'
```

Please note that PAGE must be set at &2100 before this program is run otherwise it will be over-written, causing a crash. The program writes a file called ManCode.

Having followed those instructions you should have 10 files on your disc, occupying about 21K of space. The program should now be ready for use.

Everything can be started by typing CHAIN 'B.ManFast'. The screen should fill with a





picture of the entire Mandelbrot set.

A rectangle should appear in the corner of the screen. This is the cursor and it marks the area to be expanded. The cursor can be moved with the familiar Z,X,* and ? keys. These move the cursor left, right, up and down respectively. The up and down cursor keys (arrows) are used to expand and contract the rectangle.

Pressing '@' will expand the rectangle to fill the entire screen. This is useful if you want to try the same plot again with a different number of iterations. Pressing 'P' will produce a printer dump of the screen together with its co-ordinates.

Pressing RETURN will save the screen to disc and prepare for the next 'zoom' into the set. The program allocates a new filename to each picture that it saves on the disc. This is completely automatic.

When you have finished with the program you can rename the files or delete the ones you do not want to keep. The files will be named S.ManScr0, S.ManScr1, S.ManScr2 and so on. After pressing RETURN the co-ordinates will be displayed and you will be asked for the number of iterations for this plot. This will depend on how far into the set you have gone and how much detail you want to include.

The maximum number of iterations is 255. As a rule try 32, 48, 64 and 128 for successive plots. This is really something best learnt from experience.

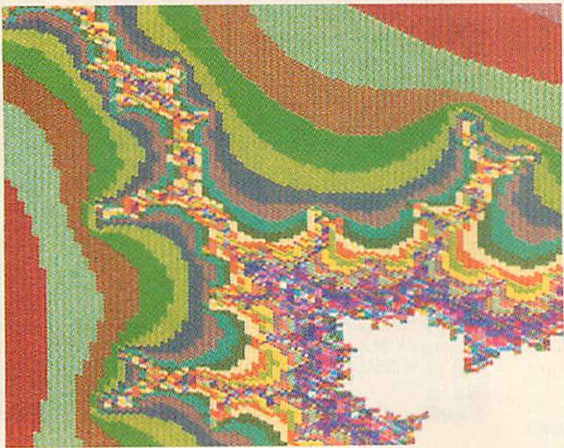
Every time you choose an area you will be given its co-ordinates. These are given as Rlo, Rhi, Ilo and Ihi. They represent the lower and higher limits of the real (horizontal) and imaginary (vertical) axes. The co-ordinates are also given in a different format, the X,Y and S system used in the *BAU* landscape program. (September 1989)

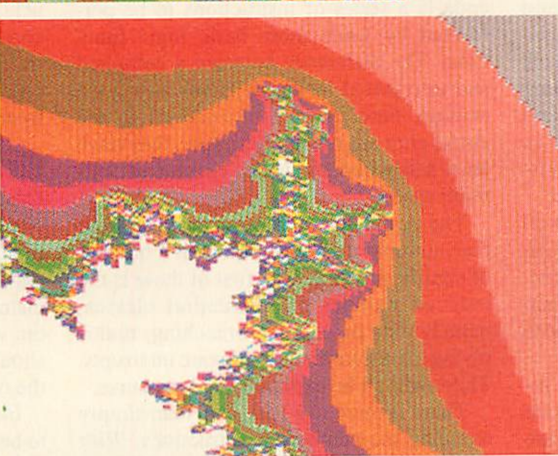
Since the screens are saved in a compressed format they cannot be loaded in the normal way. To load a compressed screen simply type *LDFRM followed by the name of the screen. If the filename is suffixed with a letter 'R' (separated by a space), the area of the screen that you choose to expand will be highlighted.

Screen compression

The screen compression routines use a modified form of run-length encoding and offer average savings on space of around 82 percent. Rather than writing every byte to the file,









this algorithm takes advantage of the fact that large areas of the picture are of the same colour.

It writes two bytes to the file for each run. The first contains the colour information and the second represents the length of the run meaning how many times that colour is repeated.

This can become inefficient for fine detail as you may be storing two bytes where you only require one. This algorithm avoids the problem by setting the most significant bit of the colour code if a colour only occurs once.

It can do this because you are never going to get any flashing colours on screen, hence this bit would otherwise be unused. The load routine tests the bit to determine whether it should read another byte or plot it as a single point.

These routines are designed specifically for use with this program and rely on the fact that the pictures are stippled. This immediately halves the amount of information that needs to be written to disc as you only need store every other byte. The missing bytes can be constructed from their neighbours using a bit of simple logic.

This means that these routines are unlikely to work outside this program, though they should work with other stippled pictures. If they are used to save a normal mode 2 screen the routine will attempt to turn it into a stippled version. The results could be quite interesting but not, I imagine, very useful.

Printer dumps

The printer dump routine produces a large (about 170 x 135mm) grey-scale proportional dump of the contents of the screen. The dump will fit a sheet of A4 paper with a margin of 20mm on each side. It is a positive dump so black areas on screen will appear black on paper.

This dump has been used successfully on a number of different printers including a Brother M-1009 and an Epson FX80/FX100.

It uses fairly standard Epson control codes and relies on normal double-density graphics rather than the new CRT-modes which not all printers support.

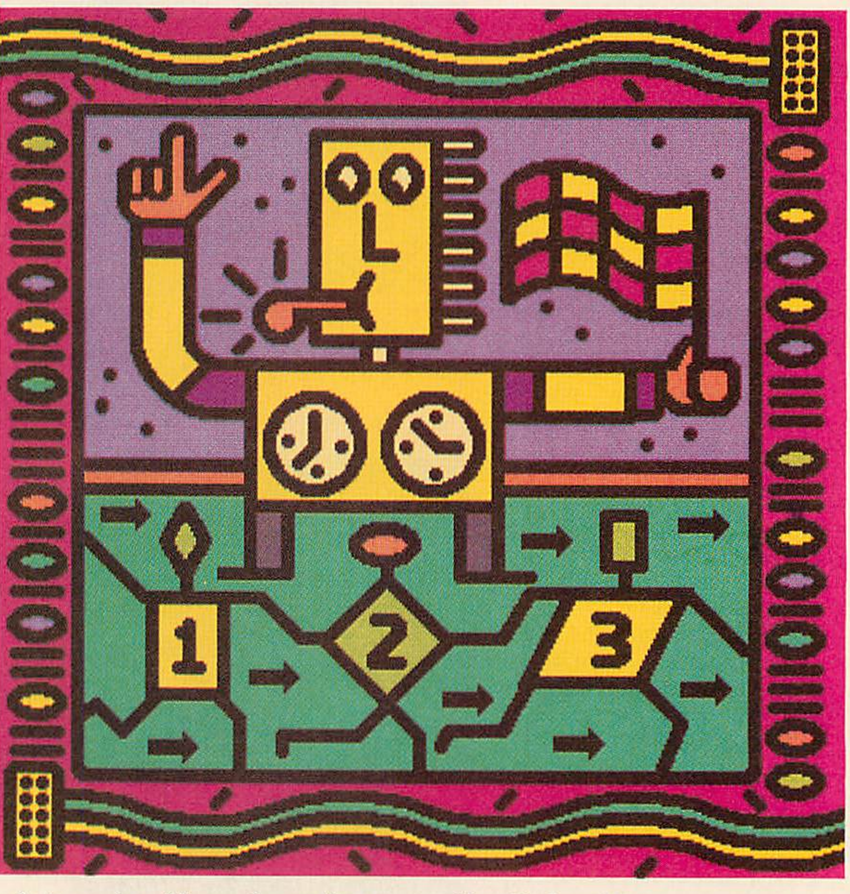
The printer dump can be called by typing *RUN M.ManDump but it will only work with stippled pictures. For this reason, if you want to print an existing screen from disc, make sure that the rectangular cursor is not on the screen.

CHANCING YOUR ARM

At the core of both the A3000 and the Archimedes there is a powerful device – the Arm2 Risc processor. **JASON O'BROIN**, in the first of a series, uncovers the secrets of Arm programming

One of the reasons that the Archimedes, now over two years old, is still the fastest and most powerful home computer available is because Acorn designed its own microprocessor, the Arm (Acorn Risc Machine), to power it. Many of the microprocessors in common usage today are now over 10 years old (indeed, the 6502 which controls the BBC was first used in 1976 as the heart of the Apple I), and machines like the Atari ST and the Amiga use the 68000 which is nine years old. Most older chips weren't designed to be used in specific computers, and this is what makes the Arm different.

After the initial success of the BBC, Acorn's research team found that none of the available chips could really produce enough of a significant performance increase to justify building a new machine based around them. They decided to design their own chip, and looked around for the best ideas. This is when they stumbled across Risc.



Reduced instruction sets

For a long time, the philosophy behind microprocessor design has been to pack as many different instructions as possible onto the available silicon.

There is a problem with this. It has been found that although there may be a weird and wonderful instruction to take an arbitrarily sized block of numbers, multiply each individual element by the corresponding element in another block of numbers, and store the final result somewhere else in memory, this is in practice (and unsurprisingly) rarely used!

This theory is encapsulated in the 20-80 rule, which says that 20 percent of the instructions are used 80 percent of the time. The Risc philosophy is to design a chip with only those 20 percent, and make those execute as fast as possible.

Due to the complexity of some of the instructions that are available on chips like the 68000, the instructions in the chip are often microcoded as opposed to hardwired. Hardwired instructions are placed on the chip in terms of logical gates, while microcode is a series of instructions to be performed by some more basic logic functions. The difference between a compiled and interpreted language serves as a good analogy here. As the instructions in the Arm2 chip are relatively simple, they have been hardwired and hence execute at optimum speed.

The Arm2 microprocessor differs from conventional microprocessors in a number of significant areas. The first of these is the reduced number of instruction classes, namely data processing, branching, multiplying, data transfer and software interrupts. These will all be explained in due course.

There is more to a Risc chip than simply reducing the number of instructions. With a smaller and more compact instruction set comes the opportunity to provide greater efficiency of operation. In the Arm, this is achieved in four different ways; pipelining; conditional execution; data shifting and extra registers. No doubt this list sounds bewildering, but they are in fact quite simple to understand!

Pipelining

Usually microprocessors, like humans, do one thing at a time. The microprocessor has to go through three distinct stages to process an instruction. Firstly it has to get the instruction from the memory, then it works out what this instruction means and what it should do with it, and finally it performs the operation.

Each of these different operations needs to be synchronised (otherwise chaos would reign), and this is achieved by providing an external clock (this is a device that produces a pulse at fixed intervals of time).

Increasing the clock rate increases the speed the machine is capable of operating at, but the actual hardware will place constraints on how fast the clock can run.

There is an alternative solution. The three stages needed to process an instruction are independent of each other, so it would seem sensible to have them all working at the same time, but with different instructions.

While the processing section is working on the first instruction, the second instruction is being decoded and the third instruction is being fetched from memory. When the next clock pulse occurs, everything is shifted along the pipeline exactly as would happen in a factory production line. In one fell swoop, a three-fold increase in speed is achieved.

Of course, pipelining has its fair share of problems (doesn't everything?). The program counter (a 'variable' which keeps track of which instruction to fetch next) is always two instructions ahead of the actual instruction being processed, so the assembler has to take this into account, and whenever the program branches to a new instruction, the pipeline has to be cleared and started again at the new location.

As a result, programs should be written so as to avoid any unnecessary branching, which is why conditional execution was introduced.

Conditional execution

Programs are full of decisions, most of which are of the form 'Do x if y is true, else do z'. Normally in machine code this involves making a comparison, and then branching off one way if it is true and a different way if it is not true.

Much of the time, only one operation happens after the branch, and this is disastrous in a pipeline environment as the increased speed factor is suddenly lost.

The Arm2 chip provides a way out of this problem. All instructions are conditional, that is to say that when the instruction comes to be executed, if certain conditions are not met, it is just ignored.

By default, instructions always execute, but this can be easily overridden with a particular condition. (If you're feeling silly, you can even have instructions that never execute). I will come back to the different conditions that can be used.

Data shifting

From the computer's point of view, all numbers are in binary. Multiplication by two can be achieved by shifting the number left (adding a zero to the end of the number) and division of the number by two by shifting right (removing the last number), but this results in only the whole number section being saved.

So, if you take the number 10011 (which is equal to 19 in denary), and shift it left, you get 100110 (which is 38), while if you shift it right, you get 1001 (which is 9).

With data processing instructions, the operand can be shifted left or right by an arbitrary amount before the instruction is executed. For example, to multiply a number by nine, the number can be shifted left by three (which multiplies it by eight) and then added to itself.

This all happens in one instruction cycle, and hence this can be a very powerful feature. Figure 1 gives details of all the data shifting instructions.

Registers

All the microprocessor's data processing instructions act on registers, which in the case of the Arm2 are 32 bits wide. Unlike many popular microprocessors, the Arm2 has a plethora of these (27 in total, although only 16 are normally available, and generally only 13 of these are available for the programmer's use). These registers are internal to the microprocessor, and as a result can be accessed very fast.

Having so many registers is an advantage. It allows more data to be freely accessible, and reduces the amount of time spent transferring information to and from main memory. The Arm2 instruction set (with the exception of the data transfer instructions) works exclusively with registers. If you want to work on some data stored in memory, it must first be loaded into a register before it can be used.

This doesn't produce that much of an overhead as the majority of programs spend most of their time working with a small group of 'status' variables which can be kept in registers and accessed fast.

There are 16 registers in general use, r0-r15, of which r0-r12 have no particular function, but r13 is generally the stack pointer, r14 is the link register (and contains the old value of the program counter after a branch with link instruction) and r15 is the program counter.

The Arm2 has four distinct processor modes (user, supervisor, interrupt and fast interrupt), and the last three have some of their own registers mapped on top of the normal ones (see figure 2). These registers can only be accessed when the processor is in that particular mode. The other processor modes rarely need to be used.

In this article, I have looked at the features that make the Arm2 different from other microprocessors as well as making it easy and enjoyable to program. In next month's issue I will look at the instruction set in detail, and in particular, at the SWI *instruction.*

LSL #n	Logical shift left immediate - The top bit (31) is shifted into the carry flag
ASL #n	Arithmetic shift left immediate - Functionally identical to LSL
LSR #n	Logical shift right immediate - The bottom bit (0) is shifted into the carry flag
ASR #n	Arithmetic shift right immediate - Functionally identical to LSR except that bit 31 retains its old value as well as being shifted into bit 30
ROR #n	Rotate right immediate - The bottom bit is shifted into the top bit as well as into the carry
RRX	Rotate right one bit with extend - The carry is shifted into the top bit and the bottom bit is shifted into the carry
LSL rn	Logical shift left by a register
ASL rn	Arithmetic shift right by a register
LSR rn	Logical shift right by a register
ASR rn	Arithmetic shift right by a register
ROR rn	Rotate right by a register

n is the number of bit positions the value is to be shifted by

rn is the register which contains the value n (in the range 0..255)

Figure 1. Data Shifting Operators

USER	SVC	IRQ	FIQ
r0	r0	r0	r0
r1	r1	r1	r1
•	•	•	•
•	•	•	•
•	•	•	•
r7	r7	r7	r7
r8	r8	r8	r8-FIQ
r9	r9	r9	r9-FIQ
r10	r10	r10	r10-FIQ
r11	r11	r11	r11-FIQ
r12	r12	r12	r12-FIQ
r13	r13-SVC	r13-IRQ	r13-FIQ
r14	r14-SVC	r14-IRQ	r14-FIQ
r15	r15	r15	r15

r0-r12	General purpose registers
r13 (sp)	Stack pointer
r14 (ln)	Link register
r15 (pc)	Program Counter

Figure 2. Arm2 registers

enhanced word processing

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CLASSROOM CRAWLERS

CHRIS DRAGE discovers how two floor robots are fast creeping their way into the hearts of teachers

In the March issue of *BBC Acorn User* we looked at Pip and Roamer, two floor robots which seem ideal for helping schools deliver the National Curriculum's IT component. These robots are proving popular and are being put to good use in classrooms throughout the country.

Although it is early days yet, Pip and Roamer are proving a valuable way of introducing computer-shy teachers to IT. Where the computer/monitor/disc drive represents 'hi-tech' to many teachers, these diminutive devices appear to pose fewer problems in terms of integration with classroom practice.

Both these robots arrive with a set of applications notes to get you going but these are rapidly becoming eclipsed as teachers submit their experiences.

For example, Mr G Wilson, deputy head of Inverbrothock Primary School, Arbroath, has designed a very useful set of activity sheets which introduce Roamer in small, easily digestible chunks.

The ideas are basically taken from the user guide but by employing a DTP package he has made them attractive and appealing. Eight, nine and 10-year-olds have used them with success.

Another starting point is offered by the BigTrak activity cards which were included in the *Control Technology* package produced by the MEP and sent to many LEAs. A set should be held at your LEA's computing centre. These present a number of useful activities which can be adapted for Pip and Roamer.

Feedback is coming from a number of schools committed to using floor robots inside the curriculum. Most respondents to date have been teachers of primary aged children who are using Pip in a variety of ways with some excellent examples of how to integrate a robot vehicle into topic work.

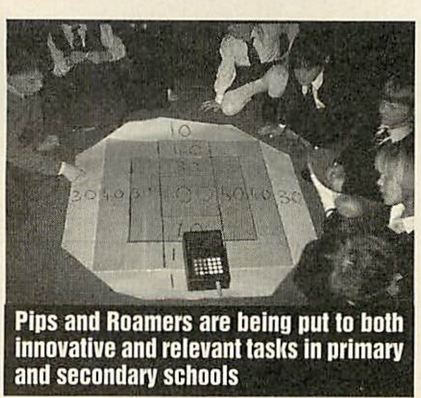
One approach is to develop a scenario where Pip is a character operating within an environment created by the class. Naturally, this environment is relevant to the topic they are engaged upon. The robot's activities are made to fit in logically with the character Pip is playing.

The characterisation can be as simple as sticking paper and card shapes on each side of the robot, or as complex as making suitably decorated, drop-over shapes to fit Pip like a suit.

At Alsager Excalibur CP School, Stoke-on-Trent, the reception class teacher introduced Pip already disguised in the character of a cat. Using a fluffy pyjama case modified to fit over the robot yet leaving the keyboard clear, 'Floss' (as the children fondly named it), was introduced to them as something the teacher had found during the holidays.

The children were asked to discuss what it was and what gender it could be before exploring what it could do. This group spent some time investigating Floss's capabilities for themselves.





Pips and Roamers are being put to both innovative and relevant tasks in primary and secondary schools

Once they had discovered the basics, especially CM (clear memory) in case ... 'Floss had something on his mind', they were given specific tasks to carry out. Floss's environment consisted of a number of props: a garden, a fish pond, a mouse house and Floss's basket, complete with 'do not disturb' sign.

When given a task like 'go and see if there are any fish in the pond', the children were expected to write the command sequence for this task then program Pip to carry it out. The results were compared with their predictions and errors corrected for a final run.

These activities, which should have a consistent, marked starting point, brought in a number of curriculum areas.

They included mathematics (sets of cats, multiplication – one cat, how many paws? – estimation, measurement, angles), science (parts of a cat's body, predators, herbivores, carnivores), English (speaking, listening, story writing, reading poems) and physical education (movement, pretending to be robots, 'programming' each other, moving like a cat).

At Oak Farm School in Hillingdon another reception class teacher used Pip in a dinosaur project. The children made dinosaurs by cutting them out of paper and colouring them in. The resulting pairs of coloured silhouettes were attached to the side of the robot, thus creating a 'Pipmetrodon'.

This character was then used in a similar way to Floss, with the class making locations for the dinosaur to travel between and exploring dinosaur lifestyles.

The same teacher used Pip as a towing device for Santa Claus' sleigh and this approach could have been used to make the sleigh itself. The idea lends itself to explorations of a more scientific nature, for instance to discover how big a load Pip can pull (one school discovered Pip could pull a 3Kg weight on a trolley).

From Mr Lloyd-Jones of Hereford and Worcester comes an idea for using Pip as part of a Viking project (history National Curriculum final report: core topic for Key Stage 2). The robot could easily be customised in a similar way to the Pipmetrodon by sticking cut-out long boats on either side of the case.

On a large map of the coasts of Scandinavia and Britain, Pip could be programmed to raid various parts of the English coast from a particular fjord. A class could be lead to cover important areas of history and geography as well as the more usual maths and English content.

A scientific investigation into the payload Pip can carry could lead in turn to an investigation into the benefits of a larger

crew of Vikings versus a larger commercial payload (loot returned home!). There must be lots of applications like this for floor-crawling robots.

St Angela's School in Glasgow had the idea of incorporating Pip into a topic about the industrial revolution (part of the history National Curriculum final report: core topic for Key Stage 2). The class made a factory with ramps and work places in which Pip was used to deliver raw materials and finished products from place to place.

There were a few problems with this basic idea which lead to some interesting design work. To avoid Pip 'bottoming' on its skids, the ramps in particular had to be carefully designed. Similarly, with loads present on Pip's platform, there was a problem of counterbalance to ensure that the robot remained slightly tail-heavy. The concepts of programming, estimation, angle and problem-solving apply here as to all the other applications.

In addition, this school extended Pip's use of sound (ie the 'grumble' and 'sing') to indicate mood. It was programmed to play the *Death March* or SOS (in Morse code) to indicate unhappiness and happy music (*Whistle While You Work*) to indicate contentment. The idea that Pip reacts to its historical surroundings by expressing happiness or misery, is an interesting one.

I, too, have successfully put both Pip and Roamer to use in an environmental studies context. On a large paper 'map' representing the local school environment, a number of roads and buildings were drawn or represented by models. In groups, the children's task was to decide what the robot was (fire engine, milk float, postal van and so on), design and make the vehicle on a jacket and then guide the robot correctly and economically around the streets, 'visiting' appropriate features marked on the map to deliver milk or letters or whatever.

Interestingly, Di Pescod of St Mary's RCVA School, Bodmin, reports that she has adopted a similar approach with 11-year-olds during a topic about pollution. On a large map certain sites were established: factory, coal mine, sewerage works, beauty spot, rubbish dump etc. Suitably dressed in a drop-over jacket, Pip became a Pollution Investigation Patrol. Using activity cards, the children programmed Pip to negotiate the route and visit various sites in order to detect and report on sources and types of pollution found.

Most of these ideas are applicable to Roamer, which costs about half what Pip does (a point that will not be missed by schools struggling under LMS). At the time of writing, however, Roamer has not been in classrooms long enough for teachers to become fully acquainted with it.

However, at least one popular means of introducing this robot to younger children has emerged. Try reading (or telling) a story to the children, concentrating on one character in particular. After subsequent discussion, the children take a Roamer jacket away to 'build the character'.

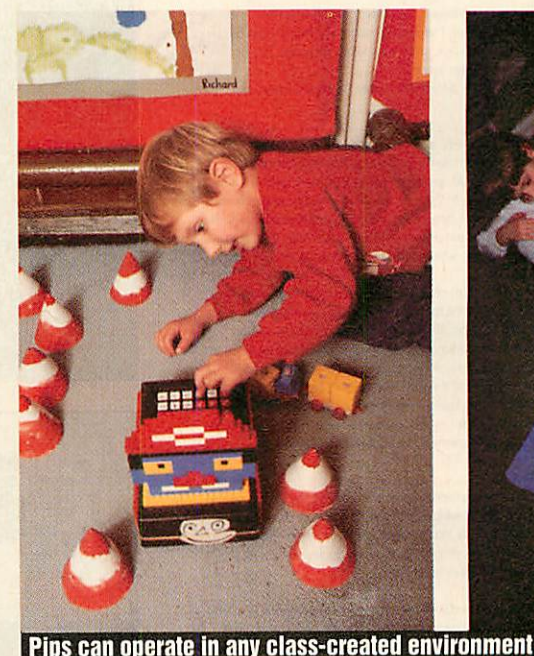
When 'dressed', Roamer must be sent on a journey around the classroom. At this point the children are helped to get the robot moving.

One child who had studied a ladybird she had caught, decorated the Roamer jacket appropriately and the robot became a ladybird. When programming it she was disappointed that Roamer could not emulate the rather erratic movements of the real creature. At this point Roamer's scaling factor was introduced and her 'ladybird' could at last move in the manner she wanted.

These are a few of the many ideas emerging for the integration of programmable vehicles across the curriculum. The applications notes accompanying each robot include many more, especially related to the introduction of programming the device.

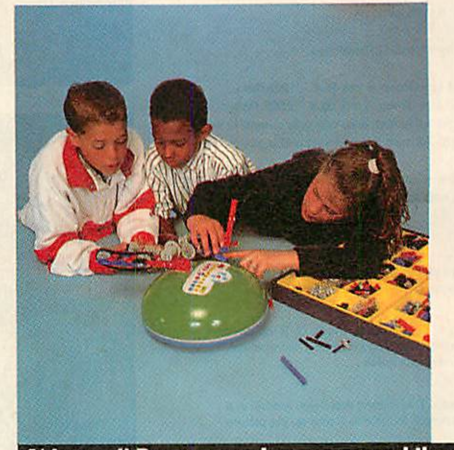
It is interesting to note, however, that from the accounts detailed above, the obvious area of learning to program has actually tended to be submerged in more general cross-curricular themes.

I suspect that there are many innovative and highly relevant tasks to which Pips and Roamers are being put in both primary and secondary schools, so why not let us hear about them? Send your experiences to me at *BBC Acorn User*.





Pips can operate in any class-created environment





A 'dressed' Roamer can journey around the classroom

Pip is available from Swallow Systems, 32 High Street, High Wycombe, Bucks HP11 1BR. Price: £224.25 + £5 p&p or cash with order discount £190.61 + £5 p&p or rental £9.20 per week + £5.75 p&p.

Roamer is available from Valiant Technology, Gulf House, 370 Old York Road, Wandsworth, London SW18 1SP. Price: £80.44 + £5 p&p. All prices are inclusive of VAT.

PINEAPPLE SOFTWARE

The Pineapple Software Real Time Colour Video Digitiser

What is a Real Time Video Digitiser? There are quite a few different 'Digitisers' available for the Archimedes but very few can accurately claim to fit the above description. The requirements are that it must be able to 'grab' a single field of video information from a colour moving source, such as a video recorder, TV, or video camera, and then process the image and display it on the computer screen.

The Pineapple Digitiser does just this, – and at a price which is less than some Digitisers which can only handle static images.

HARDWARE

The hardware consists of a double width podule which fits inside a 300 or 400 series Archimedes, and comprises a PAL colour decoder, 256K memory and various control and interface circuitry. The PAL decoder converts the input signal from your TV or video recorder into separate red, green and blue signals. These are then converted into digital form and stored in the 256K ram in a format giving 512 pixels across the picture and 256 rows vertically. The video signal in the ram is constantly changing at the same rate as the incoming video picture until the podule receives a signal from the computer to 'freeze'. At this point the last picture in the ram is frozen and can be transferred to the computer screen in many different ways depending on which software commands are issued.

SOFTWARE

The software to drive the podule is supplied on disc in the form of a relocatable module. This provides a host of additional '*' commands and SWI's which can be used even by inexperienced programmers to produce very impressive displays of live pictures or ones previously saved on disc. For non-programmers, ready written programs are provided to explore all the features of the Digitiser and produce 'Sprite' images which can be used in many other applications and 'Art' packages. The software is very easy to use and scaling routines are provided which allow you to manipulate the grabbed image by selecting any part of the picture (using a box drawn on screen controlled by the mouse) and placing it on any area of the screen, again using a box to select the position and size. This enables multi-picture images to be produced very rapidly using either live pictures or ones you have previously saved on disc. The 80 page handbook provides full details of how to implement the commands even for the inexperienced programmer.

EDUCATION

The Digitiser has many uses in education. The software commands can show many of the effects typical of the digital storage of TV pictures which can help to explain the way in which TV works. It can also be used to produce powerful audio-visual displays tailored to your own requirements from images captured using video cameras etc. For younger children, programs can be created to help learning by giving high quality visual images of animals, birds, trees etc, built into a 'quiz' format. The possibilities here are endless.

FUN & GAMES

As well as showing off to all your friends who don't have an Archimedes, what a great computer it is, you can use the Digitiser to produce images for all sorts of games and visual demonstrations. Games such as 'Guess the Celebrity' or 'Guess the Advert' can be produced by even inexperienced programmers, simply by 'grabbing' all the necessary images from TV and saving to disc.

SPECIFICATION

Video Inputs	Pal coded video, .75 Volts – 2·5 Volts pk to pk R, G, B & sync input All inputs may be terminated by internal DIP switches.
Resolution	512 x 256 pixels
Storage system	Standard version 4 bits Red, 4 bits Green, 4 bits Blue – 192KRam Extended version 5 bits Red, 6 bits Green, 5 bits Blue – 256K Ram
Picture Area	The Digitiser harware allows the full screen area normally viewed to be stored in the podule ram. Horizontal shift, Vertical shift and width can be adjusted internally if required.
PAL Decoder	The PAL decoder provides manual control of Brightness, Contrast and Saturation, combined with full auto saturation control.

QUESTIONS & ANSWERS

Q – What is the difference between the 12 bit and 16 bit version?

A – The 12 bit version can produce very high quality pictures, those shown on this page were produced that way, but 16 bits can give even better results particularly in high resolution screen modes.

Q – Why have an R, G, B input?

A – For those who have professional video cameras capable of producing R, G, B outputs, the R, G, B inputs can give significantly better results than the PAL inputs by avoiding the coding-decoding process. This removes some of the defects of the PAL system such as cross-colour, and also reduces noise'

Q – Is a moving picture available?

A – Yes, you can show a real live moving TV picture on the computer screen. This means that if you are using a video camera or recorder as an input source then you don't need a separate monitor to frame up the picture.

Q –Will it work on the A3000?

A – Yes, we can provide an inexpensive adaptor box which will enable the digitiser to work on the A3000 computer.

Q –Are the controls difficult to set up?

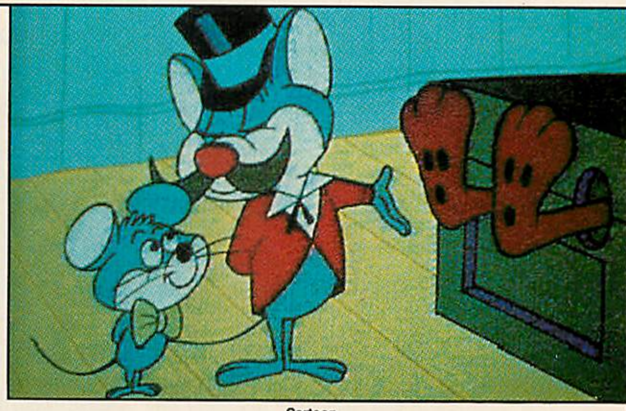
A –No, the three controls are exactly the same as on a normal TV set, Brightness, Contrast and Colour (Saturation). They may appear difficult to get at as they are at the back of the computer, but once set to your preference the brightness and colour should not require further adjustment, and the contrast (which is the easiest to get at) will only need adjusting if the video input source is changed.

Q –Does it take a long time to Digitise a full screen colour image?

A –Not really, a full screen image takes just 6 seconds on a standard 310, and reduced size images take proportionately shorter times.

Q –What software commands are built into the module?

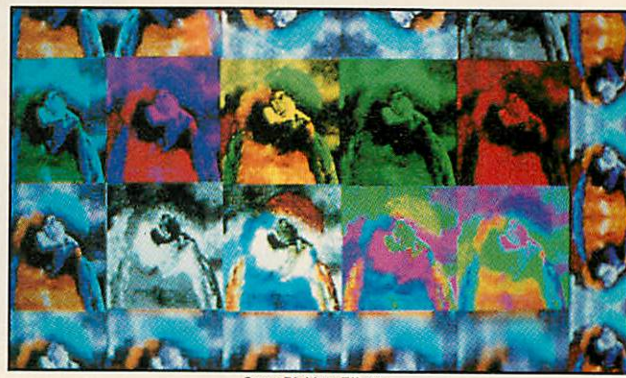
A –The software is under continual development and updates will be made available under our usual updating schemes (i.e) most updates are free), but the currently available commands are :– Average, Bits, Default, Digitise, Flip, Focus, Freeze, Image, Loadscreen, Loadsprite, Loadvideo, Mono, Moving, Negative, Noise, Outline, Palette, Primary, Restorescreen, SaveAIM, Savescreen, Savesprite, Savevideo, Screenarea, Setvideo, Unfreeze, Videoarea.



Cartoon



A Multi Picture Image



Some Digitiser Effects

– 'Pineapple has produced one of the 'ultimate' Computer Video Digitisers' –

– 'The Pineapple Colour Digitiser looks to be one of the most professional products yet to be seen on the Archimedes' –

Acorn User – April 90

Prices

Standard £285.00

Extended £315.00

A3000 Adaptor Box £65

POSTAGE AND PACKING FREE

BBC PCB Designer

This ever popular Rom based PCB designer is suitable for all BBC micros. It's fast high density 1:1 scale print routine allows prototype boards to be made directly from a printout, and a 2:1 scale print may also be used to produce professional quality boards. A second Eprom is optionally available to add a powerful auto-track routing facility to the program. This utilises a 'rats-nest' input rountine and allows any component to be 'picked up' and moved around the board without having to re-specify component interconnection.

The full auto-route facilities are available even on a standard unexpanded model 'B'.

'PCB Autoroute is remarkable. No similar software comes near the price.'
ACORN USER Aug 88

PRICE		
	Manual track routing	£85.00
	Auto track routing	£185.00
	Plotter Driver	£35.00
		P&P Free

Still available at new discounted price! DIAGRAM II £25.00 !!!

ADFS Utilities Rom

ADU is an invaluable utility for all ADFS users. It adds over 22 new * commands to the ADFS filing system as well as providing an extensive menu facility with over 35 sub commands covering such areas as repearted disc compaction, saving and loading Rom images, auto booting of files, and many more. Transferring of files from DFS to ADFS is also made very easy.

ADU ....£29.00 P&P free

Marconi Tracker Balls

RB2/101	Bare for BBC	£49.83
RB2/101+	With software	£54.83
RB2/115	Archimedes	£49.83
RB2/107	Atari ST	£49.83
RB2/109	Amiga	£49.83
RB2/110	Nimbus	£49.83
RB2/306	IBM PC/XT/AT	£99.66

Mousetrak adapter to enable 101 and 101+ to work with Mouse software	£8.00
Archimedes adapter to enable 101, 101+ to work with Archimedes	£19.95
Postage & Packing on Tracker Balls	£1.75







EIGHT BITS SPECIAL

DAVE ACTON compiles more classic hints and tips for 8-bit micro users, with extra yellow pages laid on



Original artwork on screen

COLOUR SEPARATIONS

In the August 1988 issue of *BBC Acorn User*, Muriel Dearlove explained how colour dumps could be produced on a standard single-colour printer using several passes, changing the colour of the ribbon with each pass.

Fascinated by this technique, M Harwood of Morecambe produced a program to take the hard work out of the colour separation process and his solution is listing 4 on the yellow pages.

The program works by loading in a previ ously saved screen (in standard BBC screen mode format) and saving four screens, each one containing only one colour of pixel. These relate to the four 'process' colours used in colour printing – black, yellow, cyan and magenta. If you have used any of the flashing colours in your picture you should replace them with steady colours before starting.

The source picture is loaded for each colour. Each pixel is scanned and any that matches the colour currently being sought is changed to white. All those that do not match are changed to black. If you have a fairly empty screen, the first thing you'll notice is that the background is all turned to white on the first pass. If you intend the background on the print to be white, meaning not printed, then swap GCOL 0,7 and GCOL 0,0 in line 250.

When each screen has been scanned, the resultant mask is saved as a complete screen. Naturally this can take up quite a lot of room on a disc, so a warning is printed before the program starts. If you're not sure whether you have enough space, ESCAPE at this point, check your disc and start again. When you have all the mask screens on disc, each one can be reloaded with *LOAD followed by the filename. A three line program to print the registration marks recommended in Miss Dearlove's article and then a layer of colour is:

```
10 VDU 2:PRINT STRING$(30,''='')'''
   : VDU 3
20 *LOAD COL0
30 *GDUMP
```

Change the filename in line 20 for each successive mask and line 30 should be set to your own screen dump command.

The routine works with any of the eight BBC colours on the screen. It takes account of any changes made to the palette, by reading it with Osword 11 and adjusting each colour read from the screen. If you do redefine the colours, you'll have to add the correct VDU 19 commands after lines 220 and 330 in the listings.

The way it works is to look at each pixel on the screen and decide whether it should be included when printing each of the four coloured overlays. So for example, a magenta pixel only appears on the screen for printing with the magenta ribbon. A red pixel appears on both the magenta and yellow screens. If a pixel should be printed, it is changed to white, otherwise it is changed to black.

This can work because the colours are arranged in a logical order – red is 1, yellow is 3 and magenta is 5. So in binary, red is 001, yellow is 011 and magenta is 101. The EOR operator is used to change these


How the image breaks down into magenta, yellow and black



The final image, as reconstituted on a colour printer

colour values into 110, 100 and 010 and from there it is easy to see why red is made up of yellow plus magenta.

The four screen files are called COL0 to COL3 for cyan, magenta, yellow and black respectively. When printing them, you should always use the yellow first, then cyan, magenta and black. This avoids getting the pale ribbons dirty.

TOWER OF HANOI

Listing 2 solves the age-old Tower of Hanoi problem. This is a mathematical problem in which three pegs are fastened to a stand. There are also a number of wooden discs, each with a hole at the centre. The discs are all of different diameters. They all start in a pile on one peg, arranged in order of size with the largest disc at the bottom. The problem is to shift the pile to another peg by transferring one disc at a time. The catch is that no disc may be put on top of a smaller disc.

The number of moves required rises rapidly with the number of discs used, and is given by the formula m=2^n-1 where n is the number of discs. If n=3 then the number of moves m is seven; with four discs the number of moves is 15, and with 15 discs this number rises to 32,767 moves!

This is a good example of recursion greatly simplifying the programming. The program has only two procedures, PROCdraw and PROCproc. PROCdraw draws the disc in one of the three piles. By starting with this procedure and defining each disc in terms of four parameters, this simplifies the rest of the program:

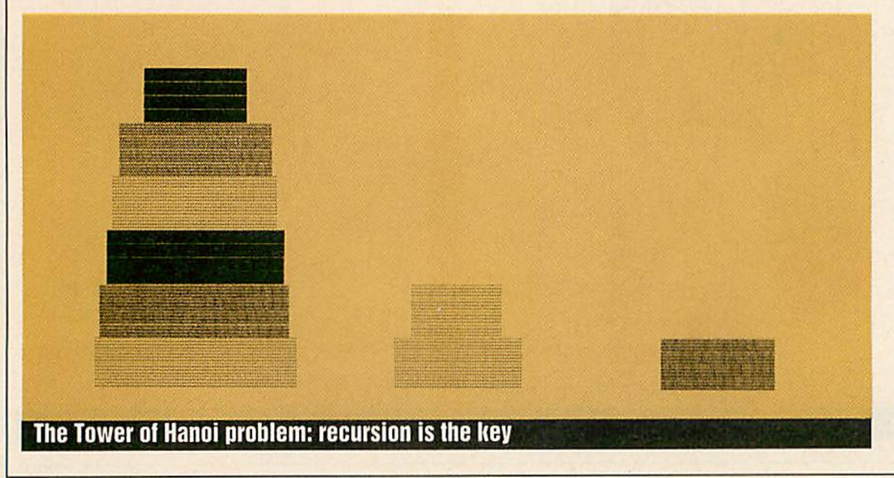
```
DEF PROCdraw(pile,n,height,col)
```

The parameter pile is the pile (1, 2 or 3) upon which the disc lies. Variable n is the number of the disc, the lowest disc in the starting pile being 1.

Variable height is the height in the appropriate pile at which the disc is to be drawn and col is used to indicate whether the disc is to be drawn or erased. In the latter case it is drawn in black.

Two variables determine the size of each disc. As n increases the width of the disc is reduced. When deciding on the height and width of the disc the variable size% is also taken into account. This is determined by the number of discs you start with. With lots of discs, they are made thin so that the display will still fit on the screen. If there are few discs then the height of each disc is fixed at a maximum of 64.

PROCproc is the recursive procedure to move the discs. A stack is created at location D. D?1 is the destination pile, D?2 is the intermediate or transfer pile and D?3 is the source pile. D is a pointer to the stack.


The Tower of Hanoi problem: recursion is the key

DUMPING IN MIDSTREAM

Many readers may know that the IBM PC has a very useful function available from the keyboard: by pressing a key called PrintScreen or PrtSc at any point within a program it sends a dump of the entire screen to the printer. The facility is for a text-only dump which is compatible with all printers.

Listing 3 on the yellow pages provides the same facility on a BBC micro. It assembles and saves a program called *PrtSc* which is *RUN before using your program. At any point during the use of your program, pressing CTRL-COPY will send a text dump to the printer, without affecting anything on screen or in the program.

It is particularly useful for, say, dumping individual records in a database without going through a report generator, or perhaps dumping a mode 7 screen in a viewdata program. Note that any graphics on screen in mode 7 are converted to their text equivalents, and in any other mode they are converted to spaces. You could alter the program to deal with graphics, and even produce a complete graphics dump by altering or replacing the routine starting at the label prinsc.

The program is completely legal and will work with spoolers and printer buffers. Any printer can be used with the normal *FX 5 setting. The program also takes account of the ignore characters, so your *FX 6 setting should be made as usual.

PrtSc works by the use of events, specifically event 4 which, when enabled, occurs 50 times every second. The installation routine at instal sets the event vector to the address of the program – this idea was mentioned way back in the May 1988 issue of *BBC Acorn User*.

The first part of the program stores all the registers on the stack. Then it checks if the necessary keys are being pressed. (Two separate checks are made – one for COPY, then for CTRL.) If they are, then it disables the event. This is so that if CTRL-COPY is pressed again, the program doesn't try to attempt another dump within the first one.

The next important action is to clear the interrupt flag, as it is disabled at the entry to an event routine. Interrupts must be enabled to allow the operating system to work, for example when printing characters.

Then the program calls the print-out routine. When this has finished, it re-enables the event so that the routine can be used again, restores all registers from the stack and exits.

The screen printing routine works by reading the mode number and using this to determine the size of the screen. Then it sends the cursor to each character location on the screen in turn, reads the character at the cursor, then sends it to the printer. Note that the program takes great care not to scroll the screen. When it reaches the last character on the bottom line of the screen, it doesn't move the cursor on to the 'next' character, as that would cause the screen to scroll up a line.

The program is configured for 80-column printers, which do not need a carriage return to move on to the next line if exactly 80 characters are placed on a line. If you have a wide printer (such as the Epson FX100) or if you are using condensed mode printing, then the variable printw in line 100 should be changed to the appropriate width in characters.

The program should work correctly on the Electron and on all 6502-based BBC micros. It resides at location &900 in memory, so take care to ensure the code doesn't become corrupted (by using the serial port for example).

MULTI-COLUMN VIEW

Andrew Pillidge of Woking supplied a short but excellent utility for *View* users which produces multi-column text quickly and simply, without any need for special paper feeding or other printer tricks.

The program doesn't even need to work on a saved file – it actually converts the *View* document in memory to a multi-column format! What is especially amazing about the routine is that this complex task is performed in less than 256 bytes of machine code. The assembly language source (listing 1 in the yellow pages) should be typed in. This produces a machine code file called SPLICE.

To use the program, first of all write your text in the normal way, bearing in mind the width of the eventual columns when laying out tables and such, and avoid completely the use of embedded commands (for the moment). Obviously, text which makes the use of macros will not be a suitable candidate for splicing into multiple columns.

Three other restrictions apply. You must not use tabs at all – any layout must be produced with additional spaces, all text must be flush to the lef-hand margin (except perhaps a small paragraph start indent) and you should not embed any further rulers into the text.

Don't worry that some of these should be essential, as you can do them after the splicing. Highlights are allowed as usual. When you have your text prepared, return to the top of the text and make two rulers. The first should be the width of the entire document and in this ruler, you should make tab stops (asterisks) for the start of each column.

For this example, we will stick with two columns so the second ruler, immediately under the first, should be the width of the first column.

As this second ruler now becomes the active ruler for the text you have written, reformat your text to the narrow extent of it. You can do this paragraph by paragraph by using f0, or you can do the lot by pressing ESCAPE and typing FORMAT from command mode. This method is quicker, but loses control over which paragraphs should be formatted.

The next stage is planning which text is spliced. Work out where you want column 1 to start, and column 2 to start. You will probably start column 1 after your heading, and start column 2 the requisite number of lines down the page to fit your paper size.

Insert marker 1 where column 1 will start and insert marker 2 where column 2 will start. The program is not intelligent. It cannot work out how deep you want the column to be.

The next point is absolutely critical. There must be at least as many lines from marker 2 to the end of the document as there are from marker 1 to marker 2. Judicious use of the L variable, which counts lines, and the SCREEN command may prove useful here. If there are less lines in column 2, insert some blank lines at the end of the document. The program inserts the end-of-text marker at the end of column 2, so you would lose any extra lines in column 1.

Having inserted markers 1 and 2, formatted the text, and counted your lines, the next stage is to run the SPLICE program. Splicing is a one-way, permanent process, and cannot be undone. It's a good idea at this point to save your unaltered file.

Return to Command mode and type *SPLICE (or *RUN SPLICE from tape). The program takes only a short time to run. When you press ESCAPE again, you will see your text has doubled in width.

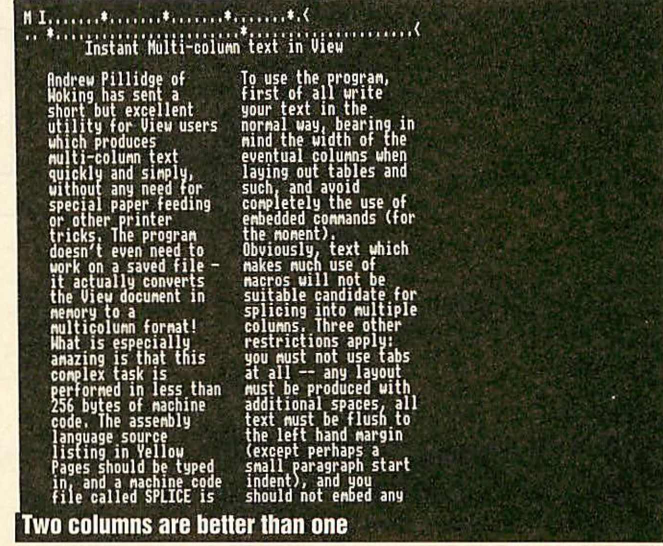
The next stage is to delete the small ruler at the top of the text, allowing the layout to be determined by the wide ruler above it. Delete this ruler and, as if by magic, the text will reformat into two columns, justified or unjustified according to your original settings. Moving the tab stop will reposition the column more precisely, and you can now go to the bottom of the text and delete any blank lines left over.

Unfortunately the format command will no longer correctly format text but you can adjust centred items and embed commands in the left-hand margin.

If you want to format more than two columns, some care must be taken. The program simply takes two chunks of text – marker 1 to marker 2 and marker 2 for the same number of lines as the first chunk – and appends each line of second chunk onto the corresponding line of the first chunk, replacing soft carriage returns with tabs.

If you want to make three columns, work out the number of lines for column 1, set the markers and perform the splice, set the markers again (the wide two-column text will have the same number of lines as column 1 alone had before) then perform the operation again.

If you had, say, three lines of heading, exactly 180 lines of text (when measured



Two columns are better than one

on a 40-column ruler) to be set in three columns of 60 lines, and three footer lines you would set marker 1 at line 4, and marker 2 at line 64, and splice. Lines 4 to 64 would then become two-column lines with a further 60-line narrow chunk of text sitting below these.

Now set marker 1 again at the beginning of line 4 and marker 2 at the new line 64 (the start of the unspliced text) and splice again. Three 60-line columns will now exist, just leaving the footer text at the bottom. Now insert a new ruler, so that the footer text can stretch all the way across the page. The principle can be extended to produce any number of columns, the limit being that the maximum width of a *View* document cannot exceed 136 columns.

It is also possible to produce columns and parts of columns of unequal width. Remember the splice program simply appends lines to other lines. It is not concerned with layout. After preparing your text in a narrow measure, it is perfectly possible to insert additional rulers and reformat paragraphs to suit. Reformat a single paragraph with f0, and delete the special ruler. *View* does not reformat again without being told so the extra or reduced width is retained. After splicing, of course, the lines in question will have to be tabbed out correctly with an additional ruler.

A fair degree of planning is needed to get good results from this program but the work is worthwhile. Unless you have a wide carriage printer, you will probably get the best results from the SPLICE routine by printing in condensed type.

Another small tip concerns the use of horizontal lines between the columns. As each column is separated by a tab, a search and replace tab to tab plus vertical bar plus space(s) will build a vertical line between two or more columns. The *View* command, from command mode is: CHANGE ^T ^T/~S.

The ^T denotes a tab,and the ^S denotes a space. Use REPLACE instead of CHANGE if you don't want to replace all tabs. The program is like a riffle shuffle of cards – cutting the deck in half and interleaving one from the bottom half between each one from the top half.

Using the position of the markers, the program copies all the text from marker 1 to marker 2 into a buffer in the free space past the end of the *View* document. (The first zero byte after OSHWM+&100 marks the end of the document). It then puts back the first line of this buffer (changing the carriage return to a tab) followed by the first line from the text starting at marker 2.

Pointers are maintained to show where the next line will come from. Each subsequent pair of lines is copied back in this manner.

Obviously, at a point roughly halfway through this process, the original marker 2 point will be overwritten but no data will be lost as this text is already transferred. Note that no check is made that there is enough free memory to buffer the first block (check your Bytes Free against the size of the block) so if the document is large and you don't have shadow memory, split it up, or go into mode 7 (mode 6 on the Electron) before executing the splice program.

The program makes illegal use of *View* workspace, reading the addresses of the markers from &53/&54 (marker 1) and &55/&56 (marker 2) (one byte higher on Electron *View*, for which this program was originally written) and &8/&9 for the current line.

The program itself uses 16 bytes of zero page, currently set to the Econet workspace &90-&9F. The program resides in page 9, which is safe for all applications other than serial or cassette input.

CUT AND PASTE ROM

Brian Ross was the author of a program that provides a simple method of copying a block of text within any text editor or other program. It emulates the 'clipboard' facility found on computers like the IBM PC and Apple Mac. With this you can mark a block of text within the program and 'cut' it out (actually 'copy' it, as the original text is not deleted) and 'paste' the same block of text back again.

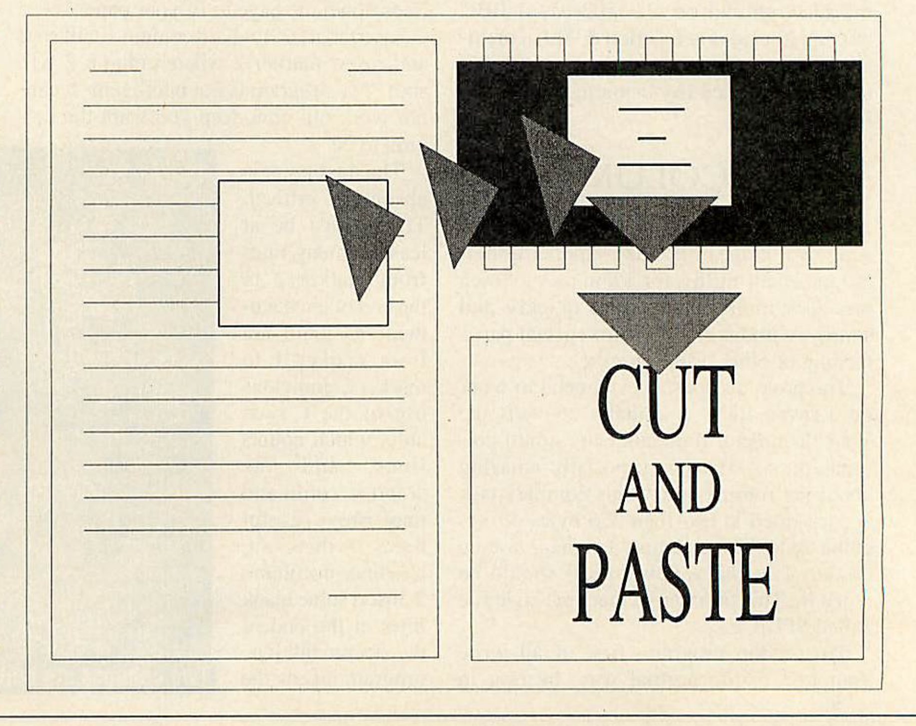
A similar facility already exists in wordprocessors such as *View*'s 'copy marked block' option – but this program is easier to use, will cut a true rectangle from the screen (rather than an area from start to finish of text) and, best of all, will allow you to paste the selected text into a different application, as the text is preserved when you change programs. So, for example, you could copy some text from *View* to *Wordwise*, without using a disc.

The text is kept in sideways Ram and the program runs as a Rom image so you must have sideways Ram fitted to use it. Type in listing 5 on the yellow pages and run it; a Rom image file called 'Cut' will be created. This should be loaded into sideways Ram in the usual way and initialised with CTRL-BREAK. (If you have a Master Compact you can of course use *SRLOAD with the 'I' option to avoid the need for CTRL-BREAK.)

Then, within any program or application, when you have text on the screen which you wish to select, press CTRL-SHIFT-G. An asterisk will appear at the top left-hand corner of the area to be selected. Move the asterisk to the top left-hand corner of the rectangle of text to be cut and press RETURN. Now move the asterisk to the bottom right-hand corner of the area. (You'll notice a hash indicates the first point you selected.)

Press RETURN again to complete the cutting process. The cursor will move quickly across the chosen area, then both markers will vanish and the cursor will be put back at its original position. The text is now stored, and you can carry on. You may wish to paste it immediately or, perhaps, continue with other operations.

Pasting the text back into an application is even simpler. Just move your cursor to the place at which you wish to paste and press CTRL-SHIFT-H. The text will appear at the cursor position. Note that at the end of each line of the rectangular area, the past-



ing routine will place a carriage return. Also, the area stored is an exact rectangular area – including spaces – and in some text editors this may cause odd effects. The message is: in order to avoid any embarrassing mistakes, practise before you need to do it for real!

The routine can only work with recognisable text characters. This is normally straightforward with the *View* family and *Wordwise*, but the routine will not work with *Interword* if you are using the special 53 and 106 character screen modes. Also the program suffers from the problem that characters other than those in the current text colours (normally white on black) are not recognised. With the cut and paste Rom they are converted to asterisks.

Once the text is pasted, the paste routine is disabled, meaning that the text can only be pasted back once. You could, if desired, alter the program so that the text could be pasted more than once.

Also, the cut routine is disabled once some text has been cut – to avoid overwriting. In other words, you must paste it back somewhere before you can cut again. This could be altered too.

Further enhancements are possible such as sending the contents of the clipboard to disc or printer, or even altering the text in some way. Finally, take care not to press any keys other than the cursors and RETURN while setting up the rectangle, or these keys will get mixed in with the pasted text.

Possible uses for the program include easy transfer of *Viewsheet* and *Viewstore* information into *View*, or similar operations with the *Inter* family.

Also, you can replay a series of Basic or * commands – make sure that you copy from one character in from the left, so you don't include the prompt.

Note that the program will work on the Electron and Master series machines, but it won't work on the humble model B.

This is because the key sequences required make use of the interrupt polling system provided in the Electron and Master OS, activated by *FX 22, which is a command that the model B does not contain.

The program works by initialising polling, and then at each poll, testing whether CTRL and SHIFT are being pressed. If so, a test is made for G or H. If G is presssed, then the cut routine is activated. If the buffer is empty, the polling is turned off to avoid re-entry, and the cursor position and text window definition are stored. The asterisk may move freely around the entire screen, but the original cursor position and text window will be restored on exit. The key control routine then allows the top left position to be set, and then the bottom right position. These are stored in ulx, uly, lrx and lry respectively. The text in the block is then read, moving the cursor with VDU 31 and reading each character with Osbyte 135.

Top-bit set characters are not stored, even when they are valid defined characters, as bit 7 is used to denote that a character is the last on the line.

The end of text is marked with &FF, which cannot be confused with an end-of-line character since &7F, the character which &FF would represent on the end of a line, is DELETE. As each byte is read it is stored in the Cut buffer, which is the area in sideways Ram immediately after the program code. After storage is complete, the original text window and cursor position are both restored.

The routine move_cur which controls cursor movement does not use Osrdch as this won't work inside a polling routine. Therefore the keyboard is read directly using Osbyte &7A and delay loops are introduced to slow down keyboard repeat. These delay loops may have to be reduced on the standard Electron, or increased for a Master. To reduce the delay, increase the value (currently 0) of the number loaded into X at labels rdkdel and dl2 etc. For example, LDX #128 would double the repeat speed. To increase the delay, introduce more NOP instructions at these points.

The Paste routine works after detecting the key sequence by redirecting the polling routine to fetch one character at each poll. It would not be possible to output the entire buffer during one poll, as this would take far too long within an interrupt routine. As each character is fetched, it is decoded to see if you have reached an end-of-line or end-of-text byte. With the former, a character 13 is inserted. When &FF is found, the paste routine is disconnected to stop further characters being output, and ordinary keyboard monitoring is restored. Unlike Cut, there are no screen windows or cursors to restore.

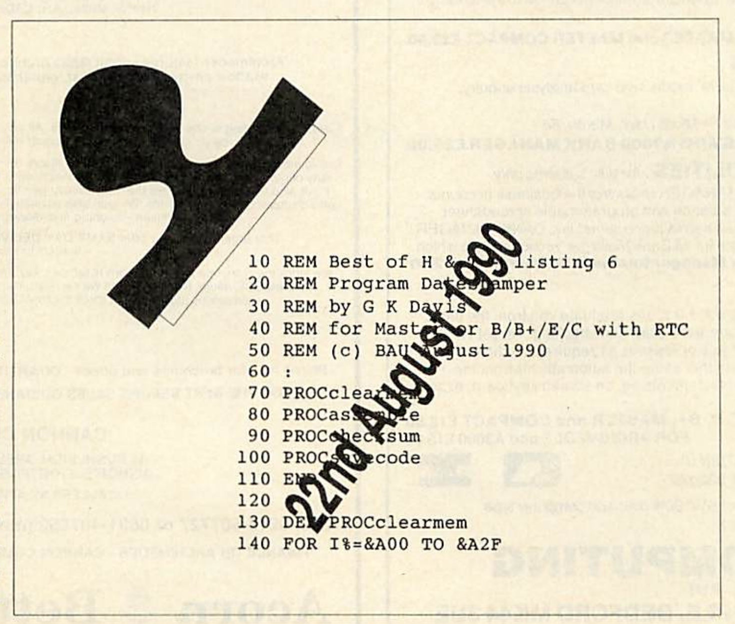
BASIC DATE STAMP

If you've ever forgotten which version of your masterpiece is the latest one and added a large chunk of code to an obsolete version, then listing 6 on the yellow pages is for you. It's a date-stamping utility from Geoff David of Lydney that automatically adds the date and time to the start of your Basic program. The utility is designed to run on the Master 128, but will also work on other BBC micros which have a real-time clock fitted which supports the Osword 14 call to read the date and time. The Solidisk RTC and Genie Watch add-ons do this, but not Econet, which uses a different call to read the clock.

The program generates a machine code file called Stamp which, when run with either *STAMP or *RUN STAMP, will add a line 0 to your program. This will be a REM statement followed by the date and time. If you keep the Stamp file on your current development disc and run it just before you save your program, then you'll always know where you're up to. If you're using ADFS the the Stamp file should be placed in the library directory. Running the program on a previously stamped file simply replaces the old date and time with a new one. Any existing line 0 will be deleted.

The program works by reading the date and time using the system call Osword 14, which returns a string in the format 'Sat, 02 Apr 1988.15:32.00'. The call requires that a buffer be specified into which to copy the information in text form. The buffer is placed immediately after a fixed string containing '0REM' and then the entire string is read, byte by byte, and placed in the keyboard buffer with the Osbyte 138 call. This is a standard call operating system which mimics keypresses.

The program then ends and the bytes in the keyboard buffer are 'typed' out as though you had entered the line yourself. The carriage return that is required at the end of the line is supplied as part of the string returned by Osword 14 and so does not need to be entered separately.



COMPATIBILITY

Program	Page	BBC B	B+/128	Master 128	Master Compact	Electron	Arc	6502SP/ Turbo	ADFS	Econet	Shadow Ram	Monthly Disc
Risc Revue	30											
Listings 1-3							■		■	■	■	■
Eight Bits	57											
Listing 1		■	■	■	■	■	■	■	■	■	■	■
Tank Game	64						■		■	■	■	■
Image Manipulation	64											
Listing 1		■	■	■	■	■	■	■	■	■	■	■
Fastbrots	72	■	■	■	■			■	■	■	■	■
Classic H+T	81											
Listing 1-6		■	■	■	■	■		■	■	■	■	■

RISC REVUE

Listing 1

```
   10 REM >RunImage (RR1)
   20 REM Pairs
   30 REM by Robert Taylor
   40 REM for Archimedes only
   50 REM (c) BAU August 199Ø
   6Ø :
   7Ø MODE 9
   8Ø PROCinit
   9Ø REPEAT
  1ØØ PROCmenu
  11Ø MOUSE OFF
  12Ø REPEAT
  13Ø PROCvars
  14Ø PROCgrid
  15Ø gos=Ø
  16Ø PROCs
  17Ø REPEAT
  18Ø gos+=1
  19Ø player=3-player
  2ØØ FOR n=1 TO 3
  21Ø MOUSE COLOUR n,(player=1)*-24Ø,Ø,(
player=2)*-24Ø
  22Ø NEXT
  23Ø IF player=2 AND number=1 OR demo=-
1 THEN PROCcomputer ELSE PROCplayer
  24Ø PROC2
  25Ø MOUSE OFF
  26Ø PROCs
  27Ø UNTIL num<3
  28Ø i=INKEY(2ØØ)
  29Ø score+=score(1)
  3ØØ IF score(2)<score(1) THEN lev+=1
  31Ø UNTIL score(2)>score(1) OR demo OR
 number=2
  32Ø IF lev>stlev*8 THEN score+=(stlev-
1)*3
  33Ø IF demo THEN score=Ø
  34Ø MOUSE ON
  35Ø UNTIL Ø
  36Ø :
  37Ø DEF PROCinit
  38Ø ON ERROR PROCerror:GOTO 9Ø
  39Ø OFF
  4ØØ *POINTER
  41Ø *FX4,1
  42Ø red=-1:green=-1:blue=-1
  43Ø VDU 19,8,1,Ø,Ø,Ø,19,9,3,Ø,Ø,Ø,19,1
Ø,2,Ø,Ø,Ø,19,11,4,Ø,Ø,Ø
  44Ø VDU 23,137,24,2Ø,242,129,242,2Ø,24
,Ø
  45Ø VDU 23,128,6,6,12,12,236,6Ø,24,Ø
  46Ø FOR N=1 TO 6
  47Ø COLOUR N,(32*N)*(red),(32*N)*(gree
n),(32*N)*(blue)
  48Ø NEXT
  49Ø COLOUR 12,16*15,16*9,16*Ø
  5ØØ COLOUR 13,16*13,16*1,16*7
  51Ø DIM grid(7,7),score(2),comp(7,7),n
ame$(1Ø,2)
  52Ø PROCscores
  53Ø score=Ø
  54Ø stlev=1
  55Ø ENDPROC
  56Ø :
  57Ø DEF PROCvars
  58Ø ox=Ø:oy=Ø:num=49
  59Ø score(1)=Ø:score(2)=Ø
  6ØØ player=1-first
  61Ø grid()=Ø
  62Ø comp()=Ø
  63Ø a=RND(7):b=RND(7)
  64Ø grid(a,b)=15
  65Ø FOR q=1 TO 2
  66Ø FOR n=1 TO 4
  67Ø FOR f=8 TO 13
  68Ø REPEAT
  69Ø a=RND(7):b=RND(7)
  7ØØ UNTIL grid(a,b)=Ø
  71Ø grid(a,b)=f*1Ø+n
  72Ø NEXT
  73Ø NEXT
  74Ø NEXT
  75Ø ENDPROC
  76Ø :
  77Ø DEF PROCgrid
  78Ø CLS
  79Ø FOR n=1 TO 7
  8ØØ FOR f=1 TO 7
  81Ø PROCslab(f*145,n*12Ø,f*145+12Ø,n*1
2Ø+95,1Ø)
  82Ø NEXT
  83Ø NEXT
  84Ø FOR n=1 TO 23
  85Ø GCOL 8
  86Ø RECTANGLE 5Ø,12Ø,2Ø,n*3Ø
  87Ø GCOL 11
  88Ø RECTANGLE 12ØØ,12Ø,2Ø,n*3Ø
  89Ø NEXT
  9ØØ ENDPROC
  91Ø :
  92Ø DEF PROCc(a,b,c,d)
  93Ø LOCAL n,len
  94Ø WAIT
  95Ø FOR n=1 TO 8
  96Ø len=VAL(MID$("1234321Ø",n,1))
  97Ø GCOL Ø
  98Ø RECTANGLE FILL a*145,b*12Ø,12Ø,95
  99Ø PROCslab(a*145,b*12Ø+(len*1Ø),a*14
5+12Ø,b*12Ø+95-(len*8),1Ø)
 1ØØØ WAIT
 1Ø1Ø NEXT
 1Ø2Ø GCOL d
 1Ø3Ø CASE c OF
 1Ø4Ø WHEN 1:
 1Ø5Ø LINE 3Ø+(a*145),23+(b*12Ø),8Ø+(a*1
45),73+(b*12Ø)
 1Ø6Ø LINE 34+(a*145),23+(b*12Ø),8Ø+(a*1
45),69+(b*12Ø)
 1Ø7Ø LINE 3Ø+(a*145),27+(b*12Ø),76+(a*1
45),73+(b*12Ø)
 1Ø8Ø LINE 3Ø+(a*145),73+(b*12Ø),8Ø+(a*1
45),23+(b*12Ø)
 1Ø9Ø LINE 3Ø+(a*145),69+(b*12Ø),76+(a*1
45),23+(b*12Ø)
 11ØØ LINE 34+(a*145),73+(b*12Ø),8Ø+(a*1
45),27+(b*12Ø)
 111Ø WHEN 2:
 112Ø CIRCLE FILL 55+(a*145),48+(b*12Ø),
25
 113Ø WHEN 3:
 114Ø RECTANGLE FILL 3Ø+(a*145),23+(b*12
Ø),5Ø,5Ø
 115Ø WHEN 4:
 116Ø MOVE 3Ø+(a*145),23+(b*12Ø)
 117Ø MOVE 8Ø+(a*145),23+(b*12Ø)
 118Ø PLOT 85,55+(a*145),73+(b*12Ø)
 119Ø WHEN 5:
 12ØØ PROCslab(a*145,b*12Ø,a*145+12Ø,b*1
2Ø+95,1Ø)
 121Ø VDU 5
 122Ø GCOL 7
 123Ø MOVE a*145+25,b*12Ø+58
 124Ø PRINT"??"
 125Ø VDU 4
 126Ø OFF
 127Ø ENDCASE
 128Ø ENDPROC
 129Ø :
 13ØØ DEF PROCplayer
 131Ø MOUSE ON
 132Ø FOR go=1 TO 2
 133Ø REPEAT
 134Ø REPEAT
 135Ø MOUSE x,y,z
 136Ø UNTIL z<>Ø AND POINT(x,y)>Ø AND PO
INT(x,y)<8
 137Ø x=INT(x/145):y=INT(y/12Ø)
 138Ø UNTIL (x<>ox OR y<>oy) AND grid(x,
y)<>Ø
 139Ø IF go=1 THEN ox=x:oy=y
 14ØØ PROCc(x,y,grid(x,y) MOD 1Ø,grid(x,
y) DIV 1Ø)
 141Ø IF RND(num)<lev THEN comp(x,y)=gri
d(x,y)
 142Ø NEXT
 143Ø ENDPROC
 144Ø :
 145Ø DEF PROC2
 146Ø IF grid(x,y)=15 OR grid(ox,oy)=15
THEN
 147Ø IF grid(x,y)=15 THEN a=ox:b=oy ELS
E a=x:b=y
 148Ø FOR n=1 TO 7
 149Ø FOR f=1 TO 7
 15ØØ IF grid(n,f)=grid(a,b) AND (n<>a O
R f<>b) THEN
 151Ø i=INKEY(8Ø)
 152Ø PROCc(n,f,grid(n,f) MOD 1Ø,grid(n,
f) DIV 1Ø)
 153Ø grid(n,f)=Ø
 154Ø c=n
 155Ø d=f
 156Ø ENDIF
 157Ø NEXT
 158Ø NEXT
 159Ø num-=3
 16ØØ score(player)+=1
 161Ø player=3-player
 162Ø i=INKEY(5Ø)
 163Ø GCOL Ø
 164Ø RECTANGLE FILL x*145,y*12Ø,12Ø,1ØØ
 165Ø RECTANGLE FILL ox*145,oy*12Ø,12Ø,1
ØØ
 166Ø RECTANGLE FILL c*145,d*12Ø,12Ø,1ØØ
 167Ø ENDIF
 168Ø IF (grid(x,y)=15 OR grid(ox,oy)=15
) AND grid(x,y)<>grid(ox,oy) THEN grid(x
,y)=Ø:comp(x,y)=Ø:grid(ox,oy)=Ø:comp(ox,
oy)=Ø:ENDPROC
 169Ø IF grid(x,y)=grid(ox,oy) THEN
 17ØØ i=INKEY(8Ø)
 171Ø GCOL Ø
 172Ø RECTANGLE FILL x*145,y*12Ø,12Ø,1ØØ
 173Ø RECTANGLE FILL ox*145,oy*12Ø,12Ø,1
ØØ
 174Ø grid(x,y)=Ø:grid(ox,oy)=Ø
 175Ø comp(x,y)=Ø:comp(ox,oy)=Ø
 176Ø num-=2:score(player)+=1
 177Ø player=3-player
 178Ø ELSE
 179Ø i=INKEY(8Ø)
 18ØØ PROCc(x,y,6,1):PROCc(ox,oy,6,1)
 181Ø ENDIF
 182Ø ox=Ø:oy=Ø
 183Ø ENDPROC
 184Ø :
 185Ø DEF PROCcomputer
 186Ø x=Ø:y=Ø
 187Ø ox=Ø:oy=Ø
 188Ø FOR a=1 TO 7
 189Ø FOR b=1 TO 7
 19ØØ FOR c=1 TO 7
 191Ø FOR d=1 TO 7
 192Ø IF comp(a,b)=comp(c,d) AND (c<>a O
R d<>b) AND comp(a,b)<>Ø THEN x=a:y=b:ox
=c:oy=d
 193Ø NEXT
 194Ø NEXT
 195Ø NEXT
 196Ø NEXT
 197Ø IF x<>Ø THEN PROCc(x,y,grid(x,y) M
OD 1Ø,grid(x,y) DIV 1Ø):PROCc(ox,oy,grid
(ox,oy) MOD 1Ø,grid(ox,oy) DIV 1Ø):ENDPR
OC
 198Ø :
 199Ø REPEAT
 2ØØØ x=RND(7):y=RND(7)
 2Ø1Ø UNTIL grid(x,y)<>Ø
 2Ø2Ø PROCc(x,y,grid(x,y) MOD 1Ø,grid(x,
y) DIV 1Ø)
 2Ø3Ø i=INKEY(6Ø)
 2Ø4Ø IF RND(num)<lev THEN comp(x,y)=gri
d(x,y)
 2Ø5Ø FOR a=1 TO 7:FOR b=1 TO 7
 2Ø6Ø IF comp(a,b)=grid(x,y) AND (x<>a O
R y<>b) THEN ox=a:oy=b
 2Ø7Ø NEXT
 2Ø8Ø NEXT
 2Ø9Ø IF ox=Ø AND oy=Ø THEN
 21ØØ REPEAT
 211Ø ox=RND(7):oy=RND(7)
 212Ø UNTIL grid(ox,oy)<>Ø AND (ox<>x OR
 oy<>y)
 213Ø ENDIF
```

Continued ▶

RISC REVUE

◀ Continued

```
 2140 IF RND(num)<lev THEN comp(ox,oy)=g
rid(ox,oy)
 2150 PROCc(ox,oy,grid(ox,oy) MOD 10,gri
d(ox,oy) DIV 10)
 2160 ENDPROC
 2170 :
 2180 DEF PROCs
 2190 GCOL 11
 2200 COLOUR 11
 2210 IF number=1 THEN PRINTTAB(37,29)"M
E"
 2220 RECTANGLE FILL 1200,120,20,score(2
)*30
 2230 GCOL 8
 2240 COLOUR 8
 2250 IF number=1 THEN PRINTTAB(0,29)"YO
U"
 2260 RECTANGLE FILL 50,120,20,score(1)*
30
 2270 ENDPROC
 2280 :
 2290 DEF PROCslab(a,b,c,d,e)
 2300 GCOL 3
 2310 RECTANGLE FILL a+e,b+e,c-a-(2*e),d
-b-(2*e)
 2320 GCOL 1
 2330 MOVE a,d
 2340 MOVE a+e,d-e
 2350 PLOT 85,c,d
 2360 MOVE a+e,d-e
 2370 MOVE c-e,d-e
 2380 PLOT 85,c,d
 2390 GCOL 2
 2400 MOVE a,b
 2410 MOVE a+e,b+e
 2420 PLOT 85,a,d
 2430 MOVE a+e,b+e
 2440 MOVE a+e,d-e
 2450 PLOT 85,a,d
 2460 GCOL 4
 2470 MOVE c,b
 2480 MOVE c-e,b+e
 2490 PLOT 85,c,d
 2500 MOVE c-e,b+e
 2510 MOVE c-e,d-e
 2520 PLOT 85,c,d
 2530 GCOL 5
 2540 MOVE a,b
 2550 MOVE a+e,b+e
 2560 PLOT 85,c-e,b+e
 2570 MOVE a,b
 2580 MOVE c-e,b+e
 2590 PLOT 85,c,b
 2600 ENDPROC
 2610 :
 2620 DEF PROCscores
 2630 c=OPENIN("<Pipe$Dir>.high")
 2640 FOR n=1 TO 10
 2650 FOR f=1 TO 2
 2660 INPUT#c,name$(n,f)
 2670 NEXT
 2680 NEXT
 2690 CLOSE#c
 2700 ENDPROC
 2710 :
 2720 DEF PROCsave
 2730 c=OPENOUT("<Pipe$Dir>.high")
 2740 FOR n=1 TO 10
 2750 FOR f=1 TO 2
 2760 PRINT#c,name$(n,f)
 2770 NEXT
 2780 NEXT
 2790 CLOSE#c
 2800 ENDPROC
 2810 :
 2820 DEF PROChi
 2830 PROCslab(255,478,1055,868,10)
 2840 COLOUR 8
 2850 COLOUR 131
 2860 FOR a=1 TO 10
 2870 IF a=up THEN COLOUR 9
 2880 PRINTTAB(10,5+a)name$(a,1);TAB(31-
LEN(name$(a,2)),5+a)name$(a,2)
 2890 IF a=up THEN COLOUR 8
 2900 NEXT
 2910 COLOUR 13
 2920 PROCslab(474,905,844,984,10)
 2930 PRINTTAB(16,2)"HI-SCORES"
 2940 ENDPROC
 2950 :
 2960 DEF PROCmenu
 2970 escape=1
 2980 MOUSE ON
 2990 CLS
 3000 up=0
 3010 FOR n=1 TO 10
 3020 IF score>VAL(name$(n,2)) THEN up=n
:n=11
 3030 NEXT
 3040 IF up>0 THEN
 3050 FOR n=10 TO up+1 STEP -1
 3060 name$(n,1)=name$(n-1,1)
 3070 name$(n,2)=name$(n-1,2)
 3080 NEXT
 3090 name$(up,1)=""
 3100 name$(up,2)=STR$(score)
 3110 ENDIF
 3120 PROChi
 3130 PROCslab(550,10,760,88,10)
 3140 PRINTTAB(18,30)"START"
 3150 IF up>0 THEN PROCenter
 3160 PROCslab(405,190,905,350,10)
 3170 PRINTTAB(15,22)"SKILL LEVEL"
 3180 FOR n=1 TO 5
 3190 PROCslab(408+(n*75),225,458+(n*75)
,275,10)
 3200 IF n=stlev THEN GCOL 8:RECTANGLE F
ILL 423+(n*75),240,20,20
 3210 NEXT
 3220 REPEAT
 3230 REPEAT
 3240 MOUSE x,y,z
 3250 UNTIL z<>0
 3260 IF y>225 AND y<275 THEN
 3270 IF x>483 AND x<533 THEN PROCl(1)
 3280 IF x>558 AND x<608 THEN PROCl(2)
 3290 IF x>633 AND x<683 THEN PROCl(3)
 3300 IF x>708 AND x<758 THEN PROCl(4)
 3310 IF x>783 AND x<833 THEN PROCl(5)
 3320 ENDIF
 3330 UNTIL x>550 AND x<760 AND y>10 AND
y<88
 3340 lev=stlev*8
 3350 demo=0
 3360 first=-1
 3370 number=0
 3380 COLOUR 128
 3390 CLS
 3400 COLOUR 131
 3410 COLOUR 8
 3420 PROCslab(290,800,615,900,10)
 3430 PRINTTAB(10,5)"1 PLAYER"
 3440 PROCslab(665,800,1015,900,10)
 3450 PRINTTAB(22,5)"2 PLAYER"
 3460 PROCslab(530,640,760,735,10)
 3470 PRINTTAB(18,10)"DEMO"
 3480 PROCslab(400,480,900,575,10)
 3490 PRINTTAB(15,15)"GO FIRST"
 3500 COLOUR 9
 3510 PROCslab(790,504,840,554,5):PRINTT
AB(25,15)""
 3520 REPEAT
 3530 REPEAT
 3540 MOUSE x,y,z
 3550 UNTIL z<>0
 3560 IF x>290 AND x<615 AND y>800 AND y
<900 THEN number=1
 3570 IF x>665 AND x<1015 AND y>800 AND
y<900 THEN number=2
 3580 IF x>530 AND x<760 AND y>640 AND y
<735 THEN demo=-1
 3590 IF x>400 AND x<900 AND y>480 AND y
<575 THEN
 3600 first=-1-first
 3610 IF first=-1 THEN PRINTTAB(25,15)"
" ELSE PRINTTAB(25,15)"X"
 3620 TIME=0
 3630 REPEAT UNTIL TIME>20
 3640 ENDIF
 3650 UNTIL number>0 OR demo
 3660 COLOUR 128
 3670 escape=0
 3680 ENDPROC
 3690 :
 3700 DEF PROCenter
 3710 COLOUR 9
 3720 PRINTTAB(9,5+up)CHR$137;
 3730 n=1
 3740 REPEAT
 3750 g=GET
 3760 IF g=127 AND n>1 OR g=8 AND n>1 TH
EN name$(up,1)=LEFT$(name$(up,1),LEN(nam
e$(up,1))-1):n-=1:PRINTCHR$(127);
 3770 IF g<>127 AND g<>13 AND n<14 AND g
>31 AND g<123 THEN name$(up,1)=name$(up,
1)+CHR$(g):n+=1:PRINTCHR$(g);
 3780 UNTIL g=13
 3790 PRINTTAB(9,5+up)" "
 3800 PROCsave
 3810 COLOUR13
 3820 ENDPROC
 3830 :
 3840 DEF PROCl(a)
 3850 IF stlev=a THEN ENDPROC
 3860 GCOL 3
 3870 RECTANGLE FILL 423+(stlev*75),240,
20,20
 3880 stlev=a
 3890 GCOL 8
 3900 RECTANGLE FILL 423+(stlev*75),240,
20,20
 3910 ENDPROC
 3920 :
 3930 DEF PROCerror
 3940 IF ERR=17 AND escape=0 THEN ENDPRO
C
 3950 IF ERR=17 AND escape=1 THEN OSCLI(
"FX4"):OSCLI("DESKTOP")
 3960 PRINTREPORT$;" at line ";ERL'"Erro
r ";ERR
 3970 END
 3980 ENDPROC
```

Listing 2

```
   10 REM >RealRoot (RR2)
   20 REM Square root using Basic routin
es
   30 REM by Maurice Hendrix
   40 REM for Archimedes only
   50 REM (c) BAU August 1990
   60 :
   70 INPUT "Enter value: "a%
   80 DIM square 5,rootcode 200,root 5
   90 |square=a%
  100 work0=0
  110 work1=1
  120 work2=2
  130 work3=3
  140 pointer=9
  150 address=10
  160 FOR pass%=0 TO 2 STEP2
  170 P%=rootcode
  180 [OPT pass%
  190 STMFD R13!,{R14}
  200 ADR pointer,square          ;point
er to FP value
  210 MOV address,R14             ;keep
R14 handy
  220 ADR R14,return0             ;retur
n address
  230 ADD PC,address,#&5C         ;branc
h to FLDA
  240 .return0
  250 ;R0..R3 contain FP value entered
  260 STMFD R13!,{R4-R7}
  270 ADR R14,return1             ;retur
n address
  280 ADD PC,address,#&78         ;branc
h to FSQRT
  290 .return1
  300 ;R0..R3 contain square root of val
ue entered
  310 LDMFD R13!,{R4-R7}
  320 ADR pointer,root            ;point
er to storage area
  330 ADR R14,return2             ;retur
n address
  340 ADD PC,address,#&58         ;branc
h to FSTA
  350 .return2
  360 LDMFD R13!,{PC}
  370 ]
  380 NEXT
  390 guess=20
  400 FOR n%=0 TO 14
  410 guess=(guess+(a%/guess))/2
  420 NEXT n%
  430 PRINT "Square root by Newton-Raphs
on method    = "guess
  440 PRINT "Square root by BASIC V
             = "SQR a%
  450 CALL rootcode
  460 PRINT "Square root by ARM using BA
SIC routines = "|root
  470 END
```

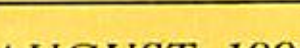
Additions to New Modes program from May 1990 RISC REVUE

Listing 3

```
  511 mode$=STR$(newmode%)
  512 IF LEN(mode$)=2 THEN mode$="0"+mod
e$
  520 title$="Mode-"+mode$+STRING$(16-LE
N("Mode-"+mode$)," ")
  720 EQUS title$
  760 EQUS title$+CHR$(9)+"1.00 ("+MID$(
TIME$,5,11)+")"
```

HINTS & TIPS

```
   10 REM Full screen text editor
   20 REM by Edmund O'Shaughnessy
   30 REM for B/B+/E/M/C
   40 REM (c) BAU Aug 1990
   50 :
   60 ON ERROR GOTO 570
   70 *FX212,184
   80 *FX214,1
   90 *FX229,1
  100 *FX4,2
  110 *FX225,128
  120 *FX226,133
  130 *FX227,138
  140 *FX228,143
  150 screen_exists%=FALSE
  160 toggle_screen%=27
  170 :
  180 MODE7
  190 ON FNoption GOTO 210,260,290,320,3
90,440,530
  200 :
  210 MODE M%
  220 PROCupdate
  230 PROCeditor
  240 GOTO 180
  250 :
  260 PROCsave
  270 GOTO 180
  280 :
  290 PROCspool
  300 GOTO 180
  310 :
  320 CLEAR
  330 PROCinit
  340 PROCset_mode
  350 MODE M%
  360 PROCeditor
  370 GOTO 180
  380 :
  390 CLEAR
  400 PROCinit
  410 PROCload
  420 GOTO 180
  430 :
  440 CLS
  450 VDU14
  460 INPUT LINE''"*" command$
  470 OSCLI command$
  480 PRINT''"Press any key to continue.
";
  490 A%=GET
  500 VDU15
  510 GOTO 180
  520 :
  530 CLS
  540 PROCquit
  550 END
  560 :
  570 CLOSE#0
  580 REPORT
  590 PRINT" at line ";ERL
  600 PRINT'"Do you wish to end (Y/other
)? ";
  610 IF (GET AND &DF)=89 THEN PROCquit:
END
  620 GOTO 180
  630 :
  640 DEFPROCinit
  650 X%=0
  660 Y%=0
  670 no%=0
  680 maxno%=80*31
  690 lines%=0
  700 screen_exists%=FALSE
  710 status_off%=FALSE
  720 full%=FALSE
  730 maxc%=218
  740 update%=9
  750 cut%=127
  760 enter%=13
  770 toggle_screen%=27
  780 toggle_status%=128
  790 del_char%=127
  800 copy%=139
```

Continued ▶


◀ **Continued**

```
 81Ø left%=14Ø
 82Ø right%=141
 83Ø down%=142
 84Ø up%=143
 85Ø search_left%=15Ø
 86Ø search_left_all%=155
 87Ø search_right_all%=156
 88Ø B$=STRING$(maxc%," ")
 89Ø B$=""
 9ØØ file$=STRING$(255," ")
 91Ø file$=""
 92Ø command$=STRING$(255," ")
 93Ø command$=""
 94Ø :
 95Ø DIM md%(7,3)
 96Ø DIM V% -1
 97Ø RESTORE
 98Ø FOR M%=Ø TO 7
 99Ø FOR D%=Ø TO 2
 1ØØØ READ md%(M%,D%)
 1Ø1Ø NEXT
 1Ø2Ø S%=(md%(M%,Ø)+1)*(md%(M%,1)+1)
 1Ø3Ø md%(M%,3)=((!4 AND &FFFF)-V%-(S%*4
)-(md%(M%,2)*1Ø24)-1Ø24) DIV maxc%
 1Ø4Ø IF md%(M%,3)<Ø THEN md%(M%,3)=Ø
 1Ø5Ø IF md%(M%,3)>S% THEN md%(M%,3)=S%
 1Ø6Ø NEXT
 1Ø7Ø ENDPROC
 1Ø8Ø :
 1Ø9Ø DATA 79,31,19
 11ØØ DATA 39,31,19
 111Ø DATA 19,31,19
 112Ø DATA 79,24,15
 113Ø DATA 39,31,9
 114Ø DATA 19,31,9
 115Ø DATA 39,24,7
 116Ø DATA 39,24,Ø
 117Ø :
 118Ø DEFFNoption
 119Ø PRINT'CHR$132;CHR$157;CHR$131;SPC(
1Ø);"AN INTEGRATED"
 12ØØ PRINTCHR$132;CHR$157;CHR$131;"STRI
NG-PROCESSOR & CODE GENERATOR"
 121Ø PRINTTAB(2,5)"1. Editor";
 122Ø PRINTTAB(2,7)"2. Save current scre
en";
 123Ø PRINTTAB(2,9)"3. Generate BASIC pr
ogram of current       screen";
 124Ø PRINTTAB(2,12)"4. Open a new scree
n";
 125Ø PRINTTAB(2,14)"5. Load a new scree
n";
 126Ø PRINTTAB(2,16)"6. * Command";
 127Ø PRINTTAB(2,18)"7. Quit";
 128Ø PRINTTAB(2,2Ø);
 129Ø IF NOT screen_exists% THEN PRINT"N
o screen active." ELSE IF full% THEN PRI
NT"The memory is now";CHR$(136);"full";
ELSE PRINT"Number of lines free = ";maxn
o%-no%;
 13ØØ PRINTTAB(2,22)"Select an option (1
-7) ...";
 131Ø REPEAT
 132Ø O%=GET
 133Ø VDU7
 134Ø UNTIL (O%>51 AND O%<56) OR O%=42 O
R (screen_exists% AND (O%=51 OR O%=5Ø OR
 O%=toggle_screen% OR O%=49))
 135Ø IF O%=42 THEN O%=54
 136Ø IF O%=toggle_screen% THEN O%=1 ELS
E O%=O%-48
 137Ø PRINT;O%;
 138Ø IF screen_exists% AND (O%=4 OR O%=
5 OR O%=7) THEN IF FNabort CLS:GOTO 119Ø
 139Ø =O%
 14ØØ :
 141Ø DEFFNabort
 142Ø PRINTTAB(1,23)CHR$(136);"WARNING";
CHR$(137);"Screen exists.";
 143Ø PRINTTAB(2,24)"Continue with Optio
n ";O%;" (Y/other)? ";
 144Ø =(GET AND &DF)<>89
 145Ø :
 146Ø DEFPROCupdate
 147Ø CLS
 148Ø IF lines%=Ø THEN GOTO 156Ø
 149Ø PROCstatus("Busy..")
 15ØØ FOR R%=Ø TO maxy%
 151Ø FOR Q%=Ø TO maxx%
 152Ø IF C$(Q%,R%)<>"" THEN IF C$(Q%,R%)
<>CHR$(Ø) THEN PRINTTAB(Q%,R%)C$(Q%,R%);
 153Ø NEXT
 154Ø NEXT
 155Ø VDU7
 156Ø PROCstatus("Buffer")
 157Ø ENDPROC
 158Ø :
 159Ø DEFPROCstatus(state$)
 16ØØ IF status_off% THEN ENDPROC
 161Ø IF state$="Buffer" AND B$="" THEN
state$=""
 162Ø PRINTTAB(Ø,maxy%)SPC(maxx%);
 163Ø PRINTTAB(Ø,maxy%)"free=";maxno%-no
%;TAB(maxx%-6,maxy%)state$;
 164Ø ENDPROC
 165Ø :
 166Ø DEFPROCeditor
 167Ø PROCstatus("Buffer")
 168Ø REPEAT
 169Ø PROCcoords
 17ØØ PRINTTAB(X%,Y%);:A%=GET
 171Ø IF A%=toggle_status% THEN PROCset_
status:GOTO 177Ø
 172Ø IF A%=enter% THEN GOTO 177Ø
 173Ø IF A%=34 OR A%=toggle_screen% THEN
 VDU7:GOTO 177Ø
 174Ø IF A%=cut% THEN PROCcut:GOTO 177Ø
 175Ø IF A%=update% THEN PROCupdate:GOTO
 177Ø
 176Ø IF FNa_char THEN PROCinput ELSE ON
 A%-copy%+1 GOSUB 235Ø,238Ø,242Ø,246Ø,25
ØØ,254Ø,265Ø,268Ø,271Ø,274Ø,277Ø,286Ø,28
6Ø,296Ø,3ØØØ,177Ø,286Ø,286Ø,177Ø,177Ø
 177Ø UNTIL A%=toggle_screen%
 178Ø ENDPROC
 179Ø :
 18ØØ DEFPROCcoords
 181Ø IF status_off% THEN ENDPROC
 182Ø VDU23,1,Ø;Ø;Ø;Ø;:@%=2
 183Ø PRINTTAB(maxx%-4,Ø)X%," ",TAB(maxx
%-1,Ø)Y%;
 184Ø @%=1Ø
 185Ø VDU23,1,1;Ø;Ø;Ø;
 186Ø ENDPROC
 187Ø :
 188Ø DEFPROCset_status
 189Ø status_off%=NOT status_off%
 19ØØ IF status_off% THEN PROCupdate ELS
E PROCstatus("Buffer")
 191Ø ENDPROC
 192Ø :
 193Ø DEFPROCcut
 194Ø IF C$(X%,Y%)=CHR$(Ø) OR C$(X%,Y%)=
"" THEN ENDPROC
 195Ø B$=C$(X%,Y%):C$(X%,Y%)=CHR$(Ø)
 196Ø lines%=lines%-1
 197Ø PROCstatus("Buffer")
 198Ø ENDPROC
 199Ø :
 2ØØØ DEFFNa_char
 2Ø1Ø =A%>31 AND A%<copy% AND A%<>toggle
_status%
 2Ø2Ø :
 2Ø3Ø DEFPROCinput
 2Ø4Ø IF (X%=maxx% AND Y%=maxy%) OR (ful
l% AND C$(X%,Y%)="") THEN VDU7:ENDPROC
 2Ø5Ø C%=Ø
 2Ø6Ø B$=""
 2Ø7Ø PROCstatus("Edit")
 2Ø8Ø PRINTTAB(X%,Y%);
 2Ø9Ø PROCedit_line
 21ØØ ENDPROC
 211Ø :
 212Ø DEFPROCedit_line
 213Ø REPEAT
 214Ø IF (C%=maxc% AND A%<>del_char%) OR
 (POS=maxx% AND VPOS=maxy% AND A%<>del_c
har%) OR (A%=del_char% AND B$="") OR A%=
34 OR NOT(FNa_char) THEN VDU7:GOTO 219Ø
 215Ø PRINT CHR$(A%);
 216Ø IF A%=del_char% THEN B$=LEFT$(B$,L
EN(B$)-1):C%=C%-1:GOTO 219Ø
 217Ø C%=C%+1
 218Ø B$=B$+CHR$(A%)
 219Ø A%=GET
 22ØØ UNTIL A%=enter%
 221Ø PROCadd
 222Ø X%=POS
 223Ø Y%=VPOS
 224Ø PROCstatus("Buffer")
 225Ø ENDPROC
 226Ø :
 227Ø DEFPROCadd
 228Ø IF B$<>"" AND (C$(X%,Y%)="" OR C$(
X%,Y%)=CHR$(Ø)) THEN lines%=lines%+1
 229Ø IF B$<>"" AND C$(X%,Y%)="" THEN C$
(X%,Y%)=STRING$(maxc%," "):no%=no%+1
 23ØØ IF no%=maxno% THEN full%=TRUE
 231Ø IF B$<>"" THEN C$(X%,Y%)=B$
 232Ø IF B$="" AND C$(X%,Y%)<>"" AND C$(
X%,Y%)<>CHR$(Ø) THEN C$(X%,Y%)=CHR$(Ø):l
ines%=lines%-1
 233Ø ENDPROC
 234Ø :
 235Ø IF C$(X%,Y%)=CHR$(Ø) OR C$(X%,Y%)=
"" THEN VDU7 ELSE B$=C$(X%,Y%):PROCstatu
s("Buffer")
 236Ø RETURN
 237Ø :
 238Ø X%=X%-1
 239Ø PROCwrap
 24ØØ RETURN
 241Ø :
 242Ø X%=X%+1
 243Ø PROCwrap
 244Ø RETURN
 245Ø :
 246Ø Y%=Y%+1
 247Ø PROCwrap
 248Ø RETURN
 249Ø :
 25ØØ Y%=Y%-1
 251Ø PROCwrap
 252Ø RETURN
 253Ø :
 254Ø IF B$="" OR (X%=maxx% AND Y%=maxy%
) OR (full% AND C$(X%,Y%)="") THEN VDU7:
RETURN
 255Ø S%=((maxy%-Y%)*(maxx%+1))+maxx%-X%
 256Ø IF S%>LEN(B$) THEN S%=LEN(B$)
 257Ø B$=LEFT$(B$,S%)
 258Ø PRINTTAB(X%,Y%)B$;
 259Ø PROCadd
 26ØØ X%=POS
 261Ø Y%=VPOS
 262Ø PROCstatus("Buffer")
 263Ø RETURN
 264Ø :
 265Ø X%=Ø
 266Ø RETURN
 267Ø :
 268Ø X%=maxx%
 269Ø RETURN
 27ØØ :
 271Ø Y%=maxy%
 272Ø RETURN
 273Ø :
 274Ø Y%=Ø
 275Ø RETURN
 276Ø :
 277Ø IF C$(X%,Y%)=CHR$(Ø) OR C$(X%,Y%)=
"" THEN VDU7:RETURN
 278Ø B$=C$(X%,Y%)
 279Ø C%=LEN(B$)
 28ØØ PROCstatus("Edit")
 281Ø PRINTTAB(X%,Y%)B$;
 282Ø A%=GET
 283Ø IF A%<>enter% THEN PROCedit_line E
LSE X%=POS:Y%=VPOS:PROCstatus("Buffer")
 284Ø RETURN
 285Ø :
 286Ø IF lines%=Ø THEN PROCnot_found:RET
URN
 287Ø PROCstatus("Busy..")
 288Ø Q%=X%
 289Ø R%=Y%
 29ØØ IF A%=search_left_all% THEN PROCle
ft_search(TRUE):GOTO 293Ø
 291Ø IF A%=search_right_all% THEN PROCr
ight_search(TRUE):GOTO 293Ø
 292Ø IF A%=search_left% THEN PROCleft_s
earch(FALSE) ELSE PROCright_search(FALSE
)
 293Ø PROCstatus("Buffer")
 294Ø RETURN
 295Ø :
 296Ø X%=maxx%
 297Ø Y%=maxy%
 298Ø RETURN
 299Ø :
 3ØØØ X%=Ø
 3Ø1Ø Y%=Ø
 3Ø2Ø RETURN
 3Ø3Ø :
 3Ø4Ø DEFPROCwrap
 3Ø5Ø IF X%<Ø THEN X%=maxx%:Y%=Y%-1
 3Ø6Ø IF X%>maxx% THEN X%=Ø:Y%=Y%+1
 3Ø7Ø IF Y%<Ø THEN Y%=maxy%
 3Ø8Ø IF Y%>maxy% THEN Y%=Ø
 3Ø9Ø ENDPROC
 31ØØ :
 311Ø DEFPROCleft_search(all%)
 312Ø X%=X%-1
 313Ø PROCwrap
 314Ø IF C$(X%,Y%)<>"" THEN IF (C$(X%,Y%
)<>CHR$(Ø) OR all%) THEN VDU7:ENDPROC
 315Ø X%=X%-1
 316Ø IF X%>-1 THEN GOTO 314Ø
 317Ø X%=maxx%
 318Ø Y%=Y%-1
 319Ø IF Y%>-1 THEN GOTO 314Ø
 32ØØ X%=Q%
 321Ø Y%=R%
 322Ø PROCnot_found
 323Ø ENDPROC
 324Ø :
 325Ø DEFPROCright_search(all%)
 326Ø X%=X%+1
 327Ø PROCwrap
 328Ø IF C$(X%,Y%)<>"" THEN IF (C$(X%,Y%
)<>CHR$(Ø) OR all%) THEN VDU7:ENDPROC
 329Ø X%=X%+1
 33ØØ IF X%<=maxx% THEN GOTO 328Ø
 331Ø X%=Ø
 332Ø Y%=Y%+1
 333Ø IF Y%<=maxy% THEN GOTO 328Ø
 334Ø X%=Q%
 335Ø Y%=R%
 336Ø PROCnot_found
 337Ø ENDPROC
 338Ø :
 339Ø DEFPROCnot_found
 34ØØ SOUND 1,-15,15Ø,2
 341Ø SOUND 1,Ø,Ø,2
 342Ø SOUND 1,-15,15Ø,2
 343Ø ENDPROC
 344Ø :
 345Ø DEFPROCsave
 346Ø CLS
 347Ø INPUT LINE''"Name of file to be sa
ved? "file$
 348Ø PRINT'"Wait."'';
 349Ø channel%=OPENOUT(file$)
 35ØØ PRINT#channel%,lines%,maxx%,maxy%,
M%
 351Ø FOR R%=Ø TO maxy%
 352Ø FOR Q%=Ø TO maxx%
 353Ø IF C$(Q%,R%)<>"" AND C$(Q%,R%)<>CH
R$(Ø) THEN PRINT#channel%,Q%,R%,C$(Q%,R%
):PRINT".";
 354Ø NEXT
 355Ø NEXT
 356Ø CLOSE#channel%
 357Ø ENDPROC
 358Ø :
 359Ø DEFPROCspool
 36ØØ CLS
 361Ø IF lines%=Ø THEN PRINT''"No lines
to spool."''"Press any key to continue."
;:A%=GET:ENDPROC
 362Ø INPUT LINE''"Name of file to be SP
OOLed? "file$
 363Ø INPUT'"Starting line number? "L%
 364Ø INPUT'"Line increment? "I%
 365Ø OSCLI "SPOOL "+file$
 366Ø PRINT';L%;"REM MODE ";M%
 367Ø FOR R%=Ø TO maxy%
 368Ø FOR Q%=Ø TO maxx%
 369Ø IF C$(Q%,R%)<>"" THEN IF C$(Q%,R%)
<>CHR$(Ø) THEN L%=L%+I%:PRINT;L%;"P.TAB(
";Q%;",";R%;")";CHR$(34);C$(Q%,R%);CHR$(
34);";"
 37ØØ NEXT
 371Ø NEXT
 372Ø *SPOOL
 373Ø ENDPROC
 374Ø :
 375Ø DEFPROCset_mode:CLS
 376Ø PRINTTAB(8,4)"Display MODEs Availa
ble";
 377Ø PRINTTAB(4,7)"MODE   Text  Lines f
ree"'
 378Ø FOR M%=Ø TO 7
 379Ø IF md%(M%,3)>Ø THEN PRINTTAB(6);M%
;"    (";md%(M%,Ø)+1;"x";md%(M%,1)+1;")
";md%(M%,3)
 38ØØ NEXT
 381Ø PRINT''TAB(4)"Select a MODE ...";
 382Ø REPEAT
 383Ø REPEAT
 384Ø M%=GET-48
 385Ø VDU7
 386Ø UNTIL M%>=Ø AND M%<=7
 387Ø UNTIL md%(M%,3)>Ø
 388Ø maxx%=md%(M%,Ø)
 389Ø maxy%=md%(M%,1)
 39ØØ maxno%=md%(M%,3)
 391Ø screen_exists%=TRUE
 392Ø DIM C$(maxx%,maxy%)
 393Ø ENDPROC
 394Ø :
 395Ø DEFPROCload
 396Ø CLS
 397Ø INPUT LINE''"Name of file to be lo
aded? "file$
 398Ø PRINT'"Wait."'';
 399Ø channel%=OPENIN(file$)
 4ØØØ INPUT#channel%,lines%,maxx%,maxy%,
M%
 4Ø1Ø maxno%=md%(M%,3)
 4Ø2Ø IF maxno%=Ø OR maxno%<lines% THEN
PRINT''"Insufficient memory for data fil
e."''"Press any key to continue.";:CLOSE
#channel%:A%=GET:CLEAR:RUN
 4Ø3Ø screen_exists%=TRUE
 4Ø4Ø DIM C$(maxx%,maxy%)
 4Ø5Ø no%=lines%
 4Ø6Ø IF no%=maxno% THEN full%=TRUE
 4Ø7Ø IF lines%=Ø THEN CLOSE#channel%:EN
DPROC
 4Ø8Ø FOR N%=1 TO lines%
 4Ø9Ø INPUT#channel%,X%,Y%
 41ØØ C$(X%,Y%)=STRING$(maxc%," ")
 411Ø INPUT#channel%,C$(X%,Y%)
 412Ø PRINT".";
 413Ø NEXT
 414Ø CLOSE#channel%
 415Ø X%=Ø
 416Ø Y%=Ø
 417Ø ENDPROC
 418Ø :
 419Ø DEFPROCquit
 42ØØ *FX212,144
 421Ø *FX214,7
 422Ø *FX4,Ø
 423Ø *FX229,Ø
 424Ø *FX225,1
 425Ø *FX226,128
 426Ø *FX227,Ø
 427Ø *FX228,Ø
 428Ø CLOSE#Ø
 429Ø ENDPROC
```

WARRIOR TANKS

```
   10 REM >Warrior Tank
   20 REM by Stuart Cupit
   30 REM and Simon Cruse
   40 REM for Arc/A3000 only
   50 REM (c) BAU August 1990
   60 :
   70 *CHANNELVOICE 1 1
   80 SYS "OS_ReadDynamicArea",2 TO ,siz
e
   90 IF size<160*1024 PRINT "Message fr
om Warrior:"''"Program needs at least 16
OK Screen Memory to Run!":VDU7:END
  100 :
  110 name$="Baldrick"
  120 lives%=3
  130 Slevel%=1
  140 highlevel=Slevel%
  150 level%=Slevel%
  160 screen%=1
  170 objectlength%=256
  180 maxobjects%=256
  190 objectlengthlog%=LOG(objectlength%
)/LOG(2)
  200 SC=2^8
  210 F=5
  220 DIM code 100000
  230 DIM objectbuffer objectlength%*max
objects%
  240 DIM sin 5120*4
  250 DIM perspective 4096*4*4
  260 DIM cord 10000
  270 DIM facet 10000
  280 DIM tempcord 10000
  290 DIM rndangle 4096*4
  300 DIM dots 512*4*2
  310 cos=sin+4096
  320 :
  330 MODE 12
  340 OFF
  350 @%=0
  360 val=0
  370 FOR loop=0 TO 11
  380 val+=21
  390 VDU 19,loop,16,val,val,val
  400 NEXT loop
  410 VDU 19,0,16,0,0,0
  420 VDU 19,12,16,255,0,0
  430 VDU 19,13,16,0,255,0
  440 VDU 19,14,16,0,255,255
  450 VDU 19,15,16,0,0,255
  460 PROCtitles("please wait ...... set
ting up")
  470 PROCass
  480 :
  490 PROCtablesetup
  500 !(info)=objectbuffer
  510 !(info+4)=sin
  520 !(info+8)=cos
  530 !(info+12)=perspective
  540 !(info+16)=cord
  550 !(info+20)=facet
  560 !(info+24)=tempcord
  570 !(info+28)=32
  580 !(info+32)=32*SC
  590 !(info+36)=0
  600 !(info+40)=rndangle
  610 !(info+44)=0
  620 !(info+48)=dots
  630 !(info+52)=4000*SC
  640 !(info+56)=0
  650 !(info+60)=0
  660 !(info+64)=level%
  670 !(info+68)=0
  680 !(info+72)=0
  690 !(info+76)=0
  700 !(info+80)=lives%
  710 !(info+84)=0
  720 :
  730 VOICES 2
  740 *CHANNELVOICE 1 7
  750 *CHANNELVOICE 2 9
  760 *FX 15,1
  770 *FX 112,1
  780 *FX 113,1
  790 CLS
  800 !(objectbuffer+0)=3
  810 !(objectbuffer+28)=0
  820 !(objectbuffer+32)=-55
  830 !(objectbuffer+36)=4000
  840 !(objectbuffer+40)=4096/2
  850 !(objectbuffer+44)=4096/2
  860 !(objectbuffer+48)=0
  870 :
  880 FOR loop=52 TO 80 STEP 4
  890 !(objectbuffer+loop)=0
  900 NEXT loop
  910 !(objectbuffer+64)=25
  920 !(objectbuffer+84)=(15*F)^2
  930 speed=100
  940 frame=0
  950 :
  960 ON
  970 IF level%>highlevel highlevel=leve
l%:name$="":CLS:OSCLI("FX 112,1"):OSCLI(
"FX 113,1"):PROCtitles("Please enter you
r name..."):INPUT TAB(49,6);name$
  980 OFF
  990 IF LEN(name$)>12 name$=LEFT$(name$
,12)
 1000 IF name$="" name$="Mr ....Shy"
 1010 REPEAT
 1020 frame+=1
 1030 CALL demo
 1040 :
 1050 IF !(objectbuffer+36)>250 !(object
buffer+36)-=speed
 1060 IF speed>0 speed-=1
 1070 !(objectbuffer+44)+=20
 1080 IF frame>600 !(objectbuffer+48)+=1
3:!(objectbuffer+40)+=27
 1090 IF frame>700 AND (frame MOD 300)=1
 !(objectbuffer)+=1
 1100 IF !(objectbuffer)>7 !(objectbuffe
r)=1
 1110 IF !(objectbuffer)=4 !(objectbuffe
r)+=3
 1120 !(objectbuffer+40)=!(objectbuffer+
40) MOD 4096
 1130 !(objectbuffer+44)=!(objectbuffer+
44) MOD 4096
 1140 !(objectbuffer+48)=!(objectbuffer+
48) MOD 4096
 1150 PROCtitles("    Press any key to s
tart.")
 1160 PROCswop:WAIT:CLS
 1170 UNTIL INKEY(0)<>-1
 1180 level%=Slevel%
 1190 !(info+64)=Slevel%
 1200 !(info+68)=0
 1210 !(info+80)=lives%
 1220 endflag%=1
 1230 !(info+72)=0
 1240 !(info+76)=-68
 1250 sign=-1
 1260 PROCobjectsetup
 1270 PROCswop:CLS
 1280 !(objectbuffer+8)=((!(info+76)^2)*
SC*sign)+(40*SC)
 1290 IF !(info+76)<0 CALL paused:GOTO 1
350
 1300 IF endflag%=2 CALL paused
 1310 col=!(info+76)/2
 1320 IF col>11 col=11
 1330 IF endflag%=2 AND !(info+80)<=0 CO
LOUR col:PRINT TAB(32,10) "G A M E  O V
E R":PRINT TAB(31,12) "O n  l e v e l  "
,level%
 1340 IF endflag%=1 CALL game
 1350 COLOUR 11
 1360 PRINT TAB(0,0) "  Lives ",!(info+8
0)
 1370 PRINT TAB(30,0) " Level ",level%
 1380 PRINT TAB(60,0) " Remaining Tanks
",(!(info+64)-!(info+68))
 1390 IF !(objectbuffer)=0 AND endflag%=
1 !(info+80)-=1:!(objectbuffer)=3:!(info
+84)=1
 1400 IF !(info+84)=2:VDU 30:VDU 11:VDU
11:!(info+84)=0
 1410 IF !(info+84)=1:VDU 30:VDU 11:!(in
fo+84)=2
 1420 IF !(info+80)<=0 AND endflag%=1 en
dflag%=2:!(info+72)=-2000*SC:CALL gameov
er:SOUND 2,-15,50,255
 1430 IF !(info+64)=!(info+68) THEN endf
lag%=2
 1440 IF endflag%=2 !(info+76)+=1
 1450 IF !(info+76)>=68 AND !(info+80)<=
0 GOTO 760
 1460 IF !(info+76)>=68 THEN
 1470 !(info+64)+=1
 1480 level%=!(info+64):!(info+68)=0
 1490 IF (level% MOD 5)=0 !(info+80)+=1
 1500 !(info+36)=0
 1510 GOTO 1220
 1520 ENDIF
 1530 IF !(info+76)<0 !(info+76)+=1
 1540 IF !(info+76)<0 sign=-1 ELSE sign=
1
 1550 IF !(info+80)>0 !(objectbuffer+8)=
((!(info+76)^2)*SC*sign)+(40*SC)
 1560 PROCswop:WAIT:CLS
 1570 GOTO 1290
 1580 END
 1590 :
 1600 DEF PROCass
 1610 FOR pass%=0 TO 2 STEP 2
 1620 P%=code
 1630 [OPT pass%
 1640 .demo
 1650 STMFD R13!,{R14}
 1660 BL loadinfo
 1670 LDR R9,[R12]
 1680 LDR R0,[R9]
 1690 LDR R4,[R9,#28]
 1700 LDR R5,[R9,#32]
 1710 LDR R6,[R9,#36]
 1720 BL vertex
 1730 BL drawfacets
 1740 LDMFD R13!,{PC}
 1750 :
 1760 .game
 1770 STMFD R13!,{R14}
 1780 BL loadinfo
 1790 LDR R0,[R12,#36]
 1800 CMP R0,#0:BEQ noshell
 1810 ADD R0,R0,#1
 1820 STR R0,[R12,#36]
 1830 CMP R0,#20
 1840 BNE noshell
 1850 MOV R0,#0:STR R0,[R12,#36]
 1860 :
 1870 .noshell
 1880 LDR R11,[R12]
 1890 BL randomnumber
 1900 CMP R0,#100:BGT noship
 1910 BL randomnumber
 1920 CMP R0,#50:BGT noship
 1930 MOV R10,#0
 1940 :
 1950 .loopfindfree4
 1960 ADD R10,R10,#1
 1970 LDR R0,[R11,R10,ASL #objectlengthl
og%]
 1980 CMP R10,#maxobjects%:BGE noship
 1990 CMP R0,#0:BNE loopfindfree4
 2000 ADD R11,R11,R10,ASL #objectlengthl
og%
 2010 MOV R0,#7:STR R0,[R11]
 2020 BL randomnumber:MOV R0,R0,ASL #9:S
UB R0,R0,#4096*SC:STR R0,[R11,#4]
 2030 MOV R0,#4000*SC:STR R0,[R11,#8]
 2040 BL randomnumber:MOV R0,R0,ASL #9:S
UB R0,R0,#4096*SC:STR R0,[R11,#12]
 2050 MOV R0,#4096/2:STR R0,[R11,#16]
 2060 BL randomnumber:STR R0,[R11,#20]
 2070 MOV R0,#0:STR R0,[R11,#24]
 2080 MOV R0,#0:STR R0,[R11,#52]
 2090 MVN R0,#50*SC:STR R0,[R11,#56]
 2100 MOV R0,#0:STR R0,[R11,#60]
 2110 MOV R0,#0:STR R0,[R11,#64]
 2120 MOV R0,#0:STR R0,[R11,#68]
 2130 MOV R0,#32:STR R0,[R11,#72]
 2140 MOV R0,#0:STR R0,[R11,#76]
 2150 MOV R0,#(8*F)^2:STR R0,[R11,#84]
 2160 :
 2170 .noship
 2180 LDR R11,[R12]
 2190 LDR R10,[R12,#28]
 2200 MOV R9,R11
 2210 BL hittank
 2220 MOV R0,#129
 2230 MVN R1,#73
 2240 MOV R2,#&FF
 2250 SWI "OS_Byte"
 2260 CMP R1,#&FF
 2270 BLEQ shell
 2280 MOV R0,#129
 2290 MVN R1,#66
 2300 MOV R2,#&FF
 2310 SWI "OS_Byte"
 2320 CMP R1,#&FF
 2330 LDREQ R9,[R11,#20]:ADDEQ R9,R9,R10
:STREQ R9,[R11,#20]
 2340 MOV R0,#129
 2350 MVN R1,#97
 2360 MOV R2,#&FF
 2370 SWI "OS_Byte"
 2380 CMP R1,#&FF
 2390 LDREQ R9,[R11,#20]:SUBEQ R9,R9,R10
:STREQ R9,[R11,#20]
 2400 MOV R0,#129
 2410 MVN R1,#79
 2420 MOV R2,#&FF
 2430 SWI "OS_Byte"
 2440 CMP R1,#&FF
 2450 BNE skipdrive1
 2460 LDR R7,[R11,#20]
 2470 MOV R1,#0:LDR R3,[R12,#32]
 2480 MOV R0,#16
 2490 BL rotateyaxis
 2500 LDR R4,[R11,#4]
 2510 LDR R5,[R11,#12]
 2520 ADD R4,R4,R1
 2530 ADD R5,R5,R3
 2540 STR R4,[R11,#4]
 2550 STR R5,[R11,#12]
 2560 STR R1,[R11,#52]
 2570 STR R3,[R11,#60]
 2580 :
 2590 .skipdrive1
 2600 MOV R0,#129
 2610 MVN R1,#104
 2620 MOV R2,#&FF
 2630 SWI "OS_Byte"
 2640 CMP R1,#&FF
 2650 BNE skipdrive2
 2660 LDR R7,[R11,#20]
 2670 MOV R1,#0:LDR R3,[R12,#32]
 2680 MOV R0,#16
 2690 BL rotateyaxis
 2700 LDR R4,[R11,#4]
 2710 LDR R5,[R11,#12]
 2720 SUB R4,R4,R1
 2730 SUB R5,R5,R3
 2740 STR R4,[R11,#4]
 2750 STR R5,[R11,#12]
 2760 MVN R1,R1
 2770 MVN R3,R3
 2780 STR R1,[R11,#52]
 2790 STR R3,[R11,#60]
 2800 :
 2810 .skipdrive2
 2820 MOV R10,#4096
 2830 SUB R10,R10,#1
 2840 LDR R9,[R11,#20]:AND R9,R9,R10:STR
R9,[R11,#20]
 2850 B skippaused
 2860 :
 2870 .paused
 2880 STMFD R13!,{R14}
 2890 BL loadinfo
 2900 :
 2910 .skippaused
 2920 MOV R0,#18:SWI 0:MOV R0,#0:SWI 0:M
OV R0,#11:SWI 0
 2930 MOV R0,#69:MOV R1,#256:MOV R2,#102
4-256:SWI &45:MOV R1,#254:SWI &45
 2940 LDR R11,[R12]
 2950 LDR R7,[R11,#20]
 2960 LDR R4,[R11,#4]:MOV R4,R4,ASR #8
 2970 LDR R5,[R11,#8]:MOV R5,R5,ASR #8
 2980 LDR R6,[R11,#12]:MOV R6,R6,ASR #8
 2990 LDR R11,[R12,#48]
 3000 LDR R9,[R12,#12]
 3010 MOV R10,#0
 3020 :
 3030 .loopdots
 3040 LDR R1,[R11],#4
 3050 MOV R2,#0
 3060 LDR R3,[R11],#4
 3070 SUB R1,R1,R4
 3080 SUB R2,R2,R5
 3090 SUB R3,R3,R6
 3100 MOV R0,#15
 3110 BL rotateyaxis
 3120 CMP R3,#1:BLE dotrange
 3130 CMP R3,#2048+1024:BGE dotrange
 3140 LDR R0,[R9,R3,ASL #2]
 3150 MUL R1,R0,R1
 3160 MUL R2,R0,R2
 3170 MOV R1,R1,ASR #12
 3180 MOV R2,R2,ASR #12
 3190 ADD R1,R1,#640
 3200 CMP R1,#0:BLT dotrange
 3210 CMP R1,#1280:BGE dotrange
 3220 ADD R2,R2,#512
 3230 MOV R0,#69
 3240 SWI &45
 3250 :
 3260 .dotrange
 3270 ADD R10,R10,#1
 3280 CMP R10,#256*2
 3290 BLT loopdots
 3300 LDR R11,[R12]
 3310 MOV R10,#1
 3320 :
 3330 .loopbuff2
 3340 LDR R0,[R11,R10,ASL #objectlengthl
og%]
 3350 CMP R0,#0:BEQ deadobj2
 3360 ADD R9,R11,R10,ASL #objectlengthlo
g%
 3370 CMP R0,#2
 3380 BLEQ hitshell
 3390 CMP R0,#3
 3400 BLEQ hittank
 3410 BLEQ tankdrive
 3420 CMP R0,#4
 3430 BEQ explopannel
 3440 CMP R0,#6
 3450 BEQ explopannel
 3460 B notexplo
 3470 :
 3480 .explopannel
 3490 LDR R1,[R9,#56]
 3500 SUB R1,R1,#.8*SC
 3510 LDR R2,[R9,#8]
 3520 LDR R3,[R12,#72]
 3530 CMP R2,R3:MVNLE R1,R1,ASR #1
 3540 STR R1,[R9,#56]
 3550 LDR R1,[R9,#64]
 3560 SUB R1,R1,#1
 3570 STR R1,[R9,#64]
 3580 CMP R1,#0
 3590 MOVLE R1,#0:STRLE R1,[R9]
 3600 :
 3610 .notexplo
 3620 CMP R0,#7:BNE notbonus
 3630 BL hitbonus
 3640 LDR R1,[R9,#8]
 3650 CMP R1,#4096*SC:MOVGE R0,#0:STRGE
R0,[R9]:BGE notbonus
 3660 CMP R1,#60
 3670 BGT notbonus
 3680 MOV R2,#0:STR R2,[R9,#56]
 3690 LDR R1,[R9,#64]
 3700 CMP R1,#0
 3710 MOVEQ R0,#1
 3720 STREQ R0,[R9,#64]
 3730 ADD R1,R1,#1
 3740 STR R1,[R9,#64]
 3750 CMP R1,#128:MOVGE R2,#50*SC:STRGE
R2,[R9,#56]:STRGE R2,[R9,#8]
 3760 AND R2,R1,#7:CMP R2,#0:BLEQ enemys
hell
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3770 :
3780 .notbonus
3790 :
3800 .deadobj2
3810 ADD R10,R10,#1
3820 CMP R10,#maxobjects%
3830 BLT loopbuff2
3840 :
3850 LDR R11,[R12]
3860 MOV R10,#1
3870 LDR R4,[R11,#4]
3880 LDR R5,[R11,#8]
3890 LDR R6,[R11,#12]
3900 LDR R7,[R11,#20]
3910 .loopbuff
3920 :
3930 LDR R0,[R11,R10,ASL #objectlengthl
og%]
3940 CMP R0,#0:BEQ deadobj
3950 ADD R9,R11,R10,ASL #objectlengthlo
g%
3960 MOV R8,R0
3970 MOV R2,#4096
3980 SUB R2,R2,#1
3990 LDR R1,[R9,#16]
4000 LDR R3,[R9,#68]
4010 ADD R1,R1,R3
4020 AND R1,R1,R2
4030 STR R1,[R9,#16]
4040 LDR R1,[R9,#20]
4050 LDR R3,[R9,#72]
4060 :
4070 ADD R1,R1,R3
4080 AND R1,R1,R2
4090 STR R1,[R9,#20]
4100 LDR R1,[R9,#24]
4110 LDR R3,[R9,#76]
4120 ADD R1,R1,R3
4130 AND R1,R1,R2
4140 STR R1,[R9,#24]
4150 LDR R1,[R9,#16]
4160 AND R1,R1,R2
4170 STR R1,[R9,#40]
4180 LDR R1,[R9,#20]
4190 ADD R1,R1,R7
4200 AND R1,R1,R2
4210 STR R1,[R9,#44]
4220 LDR R1,[R9,#24]
4230 AND R1,R1,R2
4240 STR R1,[R9,#48]
4250 LDR R1,[R9,#4]
4260 LDR R2,[R9,#8]
4270 LDR R3,[R9,#12]
4280 LDR R0,[R9,#52]
4290 ADD R1,R1,R0
4300 LDR R0,[R9,#56]
4310 ADD R2,R2,R0
4320 LDR R0,[R9,#60]
4330 ADD R3,R3,R0
4340 STR R1,[R9,#4]
4350 STR R2,[R9,#8]
4360 STR R3,[R9,#12]
4370 SUB R1,R1,R4
4380 SUB R2,R2,R5
4390 SUB R3,R3,R6
4400 MOV R1,R1,ASR #8
4410 MOV R2,R2,ASR #8
4420 MOV R3,R3,ASR #8
4430 MOV R0,#17
4440 BL rotateyaxis
4450 STR R1,[R9,#28]
4460 STR R2,[R9,#32]
4470 STR R3,[R9,#36]
4480 MOV R1,R1,ASR #5
4490 MOV R3,R3,ASR #5
4500 ADD R1,R1,#256
4510 ADD R2,R3,#1024-256
4520 CMP R8,#1:MOVEQ R0,#18:SWIEQ 0:MOV
EQ R0,#0:SWIEQ 0:MOVEQ R0,#13:SWIEQ 0
4530 CMP R8,#2:MOVEQ R0,#18:SWIEQ 0:MOV
EQ R0,#0:SWIEQ 0:MOVEQ R0,#14:SWIEQ 0
4540 CMP R8,#3:MOVEQ R0,#18:SWIEQ 0:MOV
EQ R0,#0:SWIEQ 0:MOVEQ R0,#12:SWIEQ 0
4550 CMP R8,#4:MOVEQ R0,#18:SWIEQ 0:MOV
EQ R0,#0:SWIEQ 0:MOVEQ R0,#15:SWIEQ 0
4560 CMP R8,#5:MOVEQ R0,#18:SWIEQ 0:MOV
EQ R0,#0:SWIEQ 0:MOVEQ R0,#13:SWIEQ 0
4570 CMP R8,#6:MOVEQ R0,#18:SWIEQ 0:MOV
EQ R0,#0:SWIEQ 0:MOVEQ R0,#15:SWIEQ 0
4580 CMP R8,#7:MOVEQ R0,#18:SWIEQ 0:MOV
EQ R0,#0:SWIEQ 0:BLEQ randomnumber:ANDEQ
 R0,R0,#3:ADDEQ R0,R0,#12:SWIEQ 0
4590 MOV R0,#69
4600 SWI &45
4610 :
4620 .deadobj
4630 ADD R10,R10,#1
4640 CMP R10,#maxobjects%
4650 BLT loopbuff
4660 MOV R10,#1
4670 MOV R0,#0
4680 STR R0,[R12,#60]
4690 :
4700 .loopdraw
4710 LDR R0,[R11,R10,ASL #objectlengthl
og%]
4720 CMP R0,#0:BEQ deadobj1
4730 ADD R9,R11,R10,ASL #objectlengthlo
g%
4740 LDR R4,[R9,#28]
4750 LDR R5,[R9,#32]
4760 LDR R6,[R9,#36]
4770 CMP R6,#((4096*4)-512)
4780 BGT deadobj1
4790 CMP R6,#45*F
4800 BLT deadobj1
4810 BL vertex
4820 BL drawfacets
4830 CMP R0,#3:BEQ detect
4840 CMP R0,#7:BEQ detect
4850 B deadobj1
4860 :
4870 .detect
4880 MOV R0,#1
4890 CMP R4,#0
4900 MVNLT R7,R4
4910 MOVGE R7,R4
4920 CMP R7,#50
4930 STRLE R0,[R12,#60]
4940 :
4950 .deadobj1
4960 ADD R10,R10,#1
4970 CMP R10,#maxobjects%
4980 BLT loopdraw
4990 MOV R0,#18:SWI 0:MOV R0,#0:SWI 0:M
OV R0,#11:SWI 0
5000 LDR R0,[R12,#60]
5010 CMP R0,#0
5020 BGT ontarget
5030 MOV R0,#4
5040 MOV R1,#600
5050 MOV R2,#492
5060 SWI &45
5070 MOV R0,#5
5080 MOV R2,#472
5090 SWI &45
5100 MOV R1,#620
5110 SWI &45
5120 MOV R0,#4
5130 MOV R1,#660
5140 SWI &45
5150 MOV R0,#5
5160 MOV R1,#680
5170 SWI &45
5180 MOV R2,#492
5190 SWI &45
5200 MOV R0,#4
5210 MOV R2,#532
5220 SWI &45
5230 MOV R0,#5
5240 MOV R2,#552
5250 SWI &45
5260 MOV R1,#660
5270 SWI &45
5280 MOV R0,#4
5290 MOV R1,#620
5300 SWI &45
5310 MOV R0,#5
5320 MOV R1,#600
5330 SWI &45
5340 MOV R2,#532
5350 SWI &45
5360 B offtarget
5370 :
5380 .ontarget
5390 MOV R0,#4
5400 MOV R1,#600
5410 MOV R2,#472
5420 SWI &45
5430 MOV R0,#5
5440 MOV R1,#620
5450 MOV R2,#492
5460 SWI &45
5470 MOV R0,#4
5480 MOV R1,#660
5490 SWI &45
5500 MOV R0,#5
5510 MOV R1,#680
5520 MOV R2,#472
5530 SWI &45
5540 MOV R0,#4
5550 MOV R2,#552
5560 SWI &45
5570 MOV R0,#5
5580 MOV R1,#660
5590 MOV R2,#532
5600 SWI &45
5610 MOV R0,#4
5620 MOV R1,#620
5630 SWI &45
5640 MOV R0,#5
5650 MOV R1,#600
5660 MOV R2,#552
5670 SWI &45
5680 :
5690 .offtarget
5700 LDMFD R13!,{PC}
5710 :
5720 .rotatexaxis
5730 STMFD R13!,{R4-R11,R14}
5740 LDR R10,[R12,#4]
5750 LDR R11,[R12,#8]
5760 LDR R4,[R10,R7,ASL #2]
5770 LDR R5,[R11,R7,ASL #2]
5780 MOV R4,R4,ASR R0
5790 MOV R5,R5,ASR R0
5800 RSB R0,R0,#30
5810 MUL R6,R2,R4
5820 MUL R7,R3,R5
5830 SUB R8,R6,R7
5840 MUL R6,R3,R4
5850 MUL R7,R2,R5
5860 ADD R7,R6,R7
5870 MOV R2,R7,ASR R0
5880 MOV R3,R8,ASR R0
5890 LDMFD R13!,{R4-R11,PC}
5900 :
5910 .rotateyaxis
5920 STMFD R13!,{R4-R11,R14}
5930 LDR R10,[R12,#4]
5940 LDR R11,[R12,#8]
5950 LDR R4,[R10,R7,ASL #2]
5960 LDR R5,[R11,R7,ASL #2]
5970 MOV R4,R4,ASR R0
5980 MOV R5,R5,ASR R0
5990 RSB R0,R0,#30
6000 MUL R6,R1,R4
6010 MUL R7,R3,R5
6020 SUB R8,R6,R7
6030 MUL R6,R3,R4
6040 MUL R7,R1,R5
6050 ADD R7,R6,R7
6060 MOV R1,R7,ASR R0
6070 MOV R3,R8,ASR R0
6080 LDMFD R13!,{R4-R11,PC}
6090 :
6100 .rotatezaxis
6110 STMFD R13!,{R4-R11,R14}
6120 LDR R10,[R12,#4]
6130 LDR R11,[R12,#8]
6140 LDR R4,[R10,R7,ASL #2]
6150 LDR R5,[R11,R7,ASL #2]
6160 MOV R4,R4,ASR R0
6170 MOV R5,R5,ASR R0
6180 RSB R0,R0,#30
6190 MUL R6,R1,R4
6200 MUL R7,R2,R5
6210 SUB R8,R6,R7
6220 MUL R6,R2,R4
6230 MUL R7,R1,R5
6240 ADD R7,R6,R7
6250 MOV R1,R7,ASR R0
6260 MOV R2,R8,ASR R0
6270 LDMFD R13!,{R4-R11,PC}
6280 :
6290 .gameover
6300 STMFD R13!,{R14}
6310 BL loadinfo
6320 LDR R11,[R12]
6330 MVN R10,#0
6340 :
6350 .loopfindobject2
6360 ADD R10,R10,#1
6370 LDR R0,[R11,R10,ASL #objectlengthl
og%]
6380 CMP R10,#maxobjects%:BGE finnished
6390 CMP R0,#0:BEQ loopfindobject2
6400 ADD R9,R11,R10,ASL #objectlengthlo
g%
6410 MOV R7,#0:STR R7,[R9]
6420 MOV R8,#2
6430 BL explo
6440 B loopfindobject2
6450 :
6460 .finnished
6470 LDMFD R13!,{PC}
6480 :
6490 .vertex
6500 STMFD R13!,{R0-R11,R14}
6510 LDR R11,[R12,#16]
6520 SUB R0,R0,#1
6530 ADD R11,R11,R0,ASL #10
6540 LDR R10,[R11],#16
6550 LDR R8,[R12,#24]
6560 :
6570 .loopvertex
6580 LDR R1,[R11],#4
6590 LDR R2,[R11],#4
6600 LDR R3,[R11],#8
6610 LDR R7,[R9,#40]
6620 MOV R0,#10
6630 BL rotatexaxis
6640 LDR R7,[R9,#44]
6650 MOV R0,#10
6660 BL rotateyaxis
6670 LDR R7,[R9,#48]
6680 MOV R0,#10
6690 BL rotatezaxis
6700 ADD R1,R1,R4
6710 ADD R2,R2,R5
6720 ADD R3,R3,R6
6730 LDR R0,[R12,#12]
6740 LDR R0,[R0,R3,ASL #2]
6750 MUL R1,R0,R1
6760 MUL R2,R0,R2
6770 MOV R1,R1,ASR #12
6780 MOV R2,R2,ASR #12
6790 STR R1,[R8],#4
6800 STR R2,[R8],#4
6810 STR R3,[R8],#8
6820 SUB R10,R10,#1
6830 CMP R10,#0
6840 BGE loopvertex
6850 LDMFD R13!,{R0-R11,PC}
6860 :
6870 .drawfacets
6880 STMFD R13!,{R0-R11,R14}
6890 MOV R1,#11
6900 CMP R0,#4:BEQ fade
6910 CMP R0,#6:BEQ fade
6920 B skipfade
6930 :
6940 .fade
6950 LDR R1,[R9,#64]:CMP R1,#24:MOVGE R
1,#11:MOVLT R1,R1,ASR #1
6960 :
6970 .skipfade
6980 LDR R11,[R12,#20]
6990 SUB R0,R0,#1
7000 ADD R11,R11,R0,ASL #10
7010 LDR R10,[R11],#16
7020 LDR R8,[R12,#24]
7030 MOV R0,#18:SWI 0:MOV R0,#0:SWI 0:M
OV R0,R1:SWI 0
7040 :
7050 .loopfacets
7060 LDR R3,[R11],#4
7070 ADD R7,R8,R3,ASL #4
7080 LDR R1,[R7]
7090 ADD R1,R1,#640
7100 LDR R2,[R7,#4]
7110 ADD R2,R2,#512
7120 LDR R3,[R11],#4
7130 ADD R7,R8,R3,ASL #4
7140 LDR R4,[R7]
7150 ADD R4,R4,#640
7160 LDR R5,[R7,#4]
7170 ADD R5,R5,#512
7180 LDR R3,[R11],#4
7190 ADD R7,R8,R3,ASL #4
7200 LDR R6,[R7]
7210 ADD R6,R6,#640
7220 LDR R9,[R7,#4]
7230 ADD R9,R9,#512
7240 BL hiddenfacets
7250 CMP R0,#0
7260 ADDLT R11,R11,#4
7270 BLT noplot
7280 MOV R0,#4
7290 SWI &45
7300 MOV R0,#5
7310 MOV R1,R4
7320 MOV R2,R5
7330 SWI &45
7340 MOV R1,R6
7350 MOV R2,R9
7360 SWI &45
7370 LDR R3,[R11],#4
7380 ADD R7,R8,R3,ASL #4
7390 LDR R1,[R7]
7400 ADD R1,R1,#640
7410 LDR R2,[R7,#4]
7420 ADD R2,R2,#512
7430 MOV R0,#5
7440 SWI &45
7450 LDR R3,[R11,#-16]
7460 ADD R7,R8,R3,ASL #4
7470 LDR R1,[R7]
7480 ADD R1,R1,#640
7490 LDR R2,[R7,#4]
7500 ADD R2,R2,#512
7510 MOV R0,#5
7520 SWI &45
7530 :
7540 .noplot
7550 SUB R10,R10,#1
7560 CMP R10,#0
7570 BGT loopfacets
7580 LDMFD R13!,{R0-R11,PC}
7590 :
7600 .hiddenfacets
7610 STMFD R13!,{R1-R11,R14}
7620 SUB R3,R1,R4
7630 SUB R7,R2,R5
7640 SUB R8,R6,R4
7650 SUB R10,R9,R5
7660 MUL R3,R10,R3
7670 MUL R7,R8,R7
7680 SUB R0,R3,R7
7690 LDMFD R13!,{R1-R11,PC}
7700 :
7710 .shell
7720 STMFD R13!,{R1-R11,R14}
7730 LDR R0,[R12,#36]
7740 CMP R0,#0
7750 BNE binfull1
7760 MOV R0,#1
7770 STR R0,[R12,#36]
7780 MOV R10,#0
7790 :
7800 .loopfindfree1
7810 ADD R10,R10,#1
7820 LDR R0,[R11,R10,ASL #objectlengthl
og%]
7830 CMP R10,#maxobjects%:BGE binfull1
7840 CMP R0,#0:BNE loopfindfree1
7850 ADD R9,R11,R10,ASL #objectlengthlo
g%
7860 MOV R0,#2:STR R0,[R9]
7870 MOV R0,#0:STR R0,[R9,#16]
7880 MOV R0,#0:STR R0,[R9,#20]
7890 MOV R0,#0:STR R0,[R9,#24]
7900 MOV R0,#0:STR R0,[R9,#40]
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WARRIOR TANKS

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 7910 MOV R0,#0:STR R0,[R9,#44]
 7920 MOV R0,#0:STR R0,[R9,#48]
 7930 LDR R7,[R11,#20]
 7940 MOV R1,#0:LDR R3,[R12,#32]:MOV R3,
R3,ASL #2
 7950 MOV R0,#16
 7960 BL rotateyaxis
 7970 STR R1,[R9,#52]
 7980 MOV R2,#0
 7990 STR R2,[R9,#56]
 8000 STR R3,[R9,#60]
 8010 MOV R4,#2
 8020 LDR R0,[R11,#4]:MLA R0,R4,R1,R0:ST
R R0,[R9,#4]
 8030 LDR R0,[R11,#8]:MLA R0,R4,R2,R0:ST
R R0,[R9,#8]
 8040 LDR R0,[R11,#12]:MLA R0,R4,R3,R0:S
TR R0,[R9,#12]
 8050 MOV R0,#1:STR R0,[R9,#64]
 8060 MOV R0,#123:STR R0,[R9,#68]
 8070 MOV R0,#71:STR R0,[R9,#72]
 8080 MOV R0,#53:STR R0,[R9,#76]
 8090 MOV R0,#(8*F)^2:ADD R0,R0,#(1*F)^2
:STR R0,[R9,#84]
 8100 MOV R0,#1
 8110 MVN R1,#3
 8120 MOV R2,#100
 8130 MOV R3,#70
 8140 SWI "Sound_Control"
 8150 :
 8160 .binfull1
 8170 LDMFD R13!,{R1-R11,PC}
 8180 :
 8190 .tankdrive
 8200 STMFD R13!,{R0-R11,R14}
 8210 LDR R0,[R9,#80]
 8220 CMP R0,#0
 8230 BLEQ newaim
 8240 CMP R0,#1
 8250 BLEQ attack
 8260 CMP R0,#2
 8270 BLEQ moving
 8280 CMP R0,#3
 8290 BLEQ turning
 8300 CMP R0,#4
 8310 BLEQ megaattack
 8320 LDMFD R13!,{R0-R11,PC}
 8330 :
 8340 .newaim
 8350 STMFD R13!,{R0-R11,R14}
 8360 LDR R0,[R12,#76]
 8370 CMP R0,#0
 8380 BLT endaim
 8390 BL randomnumber
 8400 AND R1,R0,#1
 8410 CMP R1,#0
 8420 BEQ newattack
 8430 AND R1,R0,#31
 8440 STR R1,[R9,#64]
 8450 BL randomnumber
 8460 AND R1,R0,#1
 8470 CMP R1,#0
 8480 SUBEQ R1,R1,#1
 8490 LDR R2,[R12,#28]
 8500 MUL R3,R2,R1
 8510 STR R3,[R9,#72]
 8520 MOV R0,#3
 8530 STR R0,[R9,#80]
 8540 B endaim
 8550 :
 8560 .newattack
 8570 LDR R1,[R9,#64]
 8580 CMP R1,#0
 8590 BGT endaim
 8600 AND R0,R0,#%111
 8610 CMP R0,#%100
 8620 MOVEQ R1,#4
 8630 MOVNE R1,#1
 8640 STR R1,[R9,#80]
 8650 :
 8660 .endaim
 8670 LDMFD R13!,{R0-R11,PC}
 8680 :
 8690 .megaattack
 8700 STMFD R13!,{R0-R11,R14}
 8710 LDR R1,[R9,#64]
 8720 CMP R1,#0
 8730 BEQ nofire
 8740 BL randomnumber
 8750 AND R0,R0,#%111
 8760 CMP R0,#0
 8770 STREQ R0,[R9,#80]
 8780 :
 8790 .nofire
 8800 BL attack
 8810 LDMFD R13!,{R0-R11,PC}
 8820 :
 8830 .attack
 8840 STMFD R13!,{R0-R11,R14}
 8850 LDR R7,[R9,#20]
 8860 LDR R11,[R12]
 8870 RSB R7,R7,#4096
 8880 MOV R1,#0
 8890 MOV R3,#400*SC
 8900 MOV R0,#18
 8910 BL rotateyaxis
 8920 LDR R2,[R9,#4]
 8930 LDR R4,[R9,#12]
 8940 SUB R1,R2,R1
 8950 SUB R2,R4,R3
 8960 LDR R3,[R11,#4]
 8970 LDR R4,[R11,#12]
 8980 SUB R1,R1,R3
 8990 SUB R2,R2,R4
 9000 MOV R1,R1,ASR #8
 9010 MOV R2,R2,ASR #8
 9020 MUL R3,R1,R1
 9030 MLA R1,R2,R2,R3
 9040 STMFD R13!,{R1}
 9050 LDR R7,[R9,#20]
 9060 LDR R8,[R12,#28]
 9070 ADD R7,R7,R8
 9080 RSB R7,R7,#4096
 9090 MOV R1,#4096
 9100 SUB R1,R1,#1
 9110 AND R7,R7,R1
 9120 MOV R1,#0
 9130 MOV R3,#400*SC
 9140 MOV R0,#18
 9150 BL rotateyaxis
 9160 LDR R2,[R9,#4]
 9170 LDR R4,[R9,#12]
 9180 SUB R1,R2,R1
 9190 SUB R2,R4,R3
 9200 LDR R3,[R11,#4]
 9210 LDR R4,[R11,#12]
 9220 SUB R1,R1,R3
 9230 SUB R2,R2,R4
 9240 MOV R1,R1,ASR #8
 9250 MOV R2,R2,ASR #8
 9260 MUL R3,R1,R1
 9270 MLA R1,R2,R2,R3
 9280 STMFD R13!,{R1}
 9290 LDR R7,[R9,#20]
 9300 LDR R8,[R12,#28]
 9310 SUB R7,R7,R8
 9320 RSB R7,R7,#4096
 9330 MOV R1,#4096
 9340 SUB R1,R1,#1
 9350 AND R7,R7,R1
 9360 MOV R1,#0
 9370 MOV R3,#400*SC
 9380 MOV R0,#18
 9390 BL rotateyaxis
 9400 LDR R2,[R9,#4]
 9410 LDR R4,[R9,#12]
 9420 SUB R1,R2,R1
 9430 SUB R2,R4,R3
 9440 LDR R3,[R11,#4]
 9450 LDR R4,[R11,#12]
 9460 SUB R1,R1,R3
 9470 SUB R2,R2,R4
 9480 MOV R1,R1,ASR #8
 9490 MOV R2,R2,ASR #8
 9500 MUL R3,R1,R1
 9510 MLA R1,R2,R2,R3
 9520 LDMFD R13!,{R2}
 9530 LDMFD R13!,{R3}
 9540 CMP R1,R2
 9550 MOVLE R4,R1:MOVGT R4,R2
 9560 CMP R4,R3
 9570 MOVGE R4,R3
 9580 CMP R4,R1:LDREQ R5,[R9,#20]:SUBEQ
R5,R5,R8:STREQ R5,[R9,#20]:BEQ donotfire
 9590 CMP R4,R2:LDREQ R5,[R9,#20]:ADDEQ
R5,R5,R8:STREQ R5,[R9,#20]:BEQ donotfire
 9600 CMP R4,R3:BNE donotfire
 9610 BL enemyshell
 9620 LDR R0,[R9,#80]
 9630 CMP R0,#4
 9640 BEQ noreset
 9650 MOV R0,#0
 9660 STR R0,[R9,#80]
 9670 :
 9680 .noreset
 9690 MOV R0,#1
 9700 STR R0,[R9,#64]
 9710 :
 9720 .donotfire
 9730 LDMFD R13!,{R0-R11,PC}
 9740 :
 9750 .enemyshell
 9760 STMFD R13!,{R0-R11,R14}
 9770 LDR R11,[R12]
 9780 MOV R10,#0
 9790 :
 9800 .loopfindfree2
 9810 ADD R10,R10,#1
 9820 LDR R0,[R11,R10,ASL #objectlengthl
og%]
 9830 CMP R10,#maxobjects%:BGE binfull2
 9840 CMP R0,#0:BNE loopfindfree2
 9850 ADD R11,R11,R10,ASL #objectlengthl
og%
 9860 MOV R0,#2:STR R0,[R11]
 9870 MOV R0,#0:STR R0,[R11,#16]
 9880 MOV R0,#0:STR R0,[R11,#20]
 9890 MOV R0,#0:STR R0,[R11,#24]
 9900 MOV R0,#0:STR R0,[R11,#40]
 9910 MOV R0,#0:STR R0,[R11,#44]
 9920 MOV R0,#0:STR R0,[R11,#48]
 9930 LDR R7,[R9,#20]
 9940 RSB R7,R7,#4096
 9950 MOV R1,#0:LDR R3,[R12,#32]:MVN R3,
R3,ASL #2
 9960 MOV R0,#16
 9970 BL rotateyaxis
 9980 STR R1,[R11,#52]
 9990 MOV R2,#0
10000 STR R2,[R11,#56]
10010 STR R3,[R11,#60]
10020 MOV R4,#1
10030 LDR R0,[R9,#4]:MLA R0,R4,R1,R0:STR
 R0,[R11,#4]
10040 MOV R0,#20*SC:STR R0,[R11,#8]
10050 LDR R0,[R9,#12]:MLA R0,R4,R3,R0:ST
R R0,[R11,#12]
10060 MOV R0,#1:STR R0,[R11,#64]
10070 MOV R0,#123:STR R0,[R11,#68]
10080 MOV R0,#71:STR R0,[R11,#72]
10090 MOV R0,#53:STR R0,[R11,#76]
10100 MOV R0,#(8*F)^2:STR R0,[R11,#84]
10110 MOV R0,#1
10120 MVN R1,#3
10130 MOV R2,#100
10140 MOV R3,#70
10150 SWI "Sound_Control"
10160 :
10170 .binfull2
10180 LDMFD R13!,{R0-R11,PC}
10190 :
10200 .turning
10210 STMFD R13!,{R0-R11,R14}
10220 LDR R1,[R9,#64]
10230 SUB R1,R1,#1
10240 STR R1,[R9,#64]
10250 CMP R1,#0
10260 BLEQ movvecset
10270 STREQ R1,[R9,#72]
10280 LDMFD R13!,{R0-R11,PC}
10290 :
10300 .moving
10310 STMFD R13!,{R0-R11,R14}
10320 LDR R1,[R9,#64]
10330 SUB R1,R1,#1
10340 STR R1,[R9,#64]
10350 CMP R1,#0
10360 STREQ R1,[R9,#80]
10370 STREQ R1,[R9,#52]
10380 STREQ R1,[R9,#60]
10390 LDMFD R13!,{R0-R11,PC}
10400 :
10410 .movvecset
10420 STMFD R13!,{R0-R11,R14}
10430 LDR R7,[R9,#20]
10440 LDR R3,[R12,#32]
10450 MOV R1,#0
10460 MOV R0,#15
10470 RSB R7,R7,#4096
10480 BL rotateyaxis
10490 MVN R1,R1
10500 MVN R3,R3
10510 STR R1,[R9,#52]
10520 STR R3,[R9,#60]
10530 BL randomnumber
10540 AND R1,R0,#255
10550 STR R1,[R9,#64]
10560 MOV R2,#2
10570 STR R2,[R9,#80]
10580 LDMFD R13!,{R0-R11,PC}
10590 :
10600 .randomnumber
10610 STMFD R13!,{R1-R11,R14}
10620 LDR R1,[R12,#40]
10630 LDR R2,[R12,#44]
10640 LDR R0,[R1,R2,ASL #2]
10650 ADD R2,R2,#1
10660 MOV R3,#4096
10670 SUB R3,R3,#1
10680 AND R2,R2,R3
10690 STR R2,[R12,#44]
10700 LDMFD R13!,{R1-R11,PC}
10710 :
10720 .hitshell
10730 STMFD R13!,{R0-R11,R14}
10740 MOV R8,#1
10750 MOV R3,#0
10760 LDR R0,[R12,#52]
10770 MVN R1,R0
10780 LDR R2,[R9,#4]
10790 CMP R2,R0
10800 STRGE R3,[R9]:BLGE explo
10810 CMP R2,R1
10820 STRLE R3,[R9]:BLLE explo
10830 LDR R2,[R9,#12]
10840 CMP R2,R0
10850 STRGE R3,[R9]:BLGE explo
10860 CMP R2,R1
10870 STRLE R3,[R9]:BLLE explo
10880 BL hitdetect
10890 CMP R1,#0
10900 BEQ missed
10910 MOV R8,#3
10920 LDR R2,[R1]
10930 CMP R2,#1:STREQ R3,[R9]:BLEQ explo
:BEQ missed
10940 CMP R2,#5:STREQ R3,[R9]:BLEQ explo
:BEQ missed
10950 CMP R2,#2:STREQ R3,[R9]:STREQ R3,[
R1]:BLEQ explo:BEQ missed
10960 CMP R2,#7:BNE notbonusobj
10970 LDR R4,[R1,#8]
10980 CMP R4,#100*SC:BGT missed
10990 LDR R4,[R12,#64]:STR R4,[R12,#68]:
MOV R8,#15:STR R3,[R9]:STR R3,[R1]:BL ex
plo
11000 B missed
11010 :
11020 .notbonusobj
11030 CMP R2,#3:BNE missed
11040 STR R3,[R9]:STR R3,[R1]:MOV R8,#15
:BL explo
11050 CMP R1,R11:LDRNE R4,[R12,#68]:ADDN
E R4,R4,#1:STRNE R4,[R12,#68]
11060 :
11070 .missed
11080 LDMFD R13!,{R0-R11,PC}
11090 :
11100 .hittank
11110 STMFD R13!,{R0-R11,R14}
11120 LDR R0,[R12,#52]
11130 MVN R1,R0
11140 LDR R2,[R9,#4]
11150 CMP R2,R0
11160 BLGE bounce
11170 CMP R2,R1
11180 BLLE bounce
11190 LDR R2,[R9,#12]
11200 CMP R2,R0
11210 BLGE bounce
11220 CMP R2,R1
11230 BLLE bounce
11240 BL hitdetect
11250 CMP R1,#0
11260 BEQ missed2
11270 LDR R2,[R1]
11280 CMP R2,#4:BEQ missed2
11290 CMP R2,#6:BEQ missed2
11300 CMP R2,#2:BEQ missed2
11310 CMP R2,#7:BEQ missed2
11320 BL bounce
11330 :
11340 .missed2
11350 LDMFD R13!,{R0-R11,PC}
11360 :
11370 .hitbonus
11380 STMFD R13!,{R0-R11,R14}
11390 BL hitdetect
11400 CMP R1,#0
11410 BEQ missedbonus
11420 LDR R2,[R9,#8]
11430 CMP R2,#100*SC
11440 BGT missedbonus
11450 LDR R3,[R1]
11460 CMP R3,#7
11470 BEQ missedbonus
11480 CMP R3,#4
11490 BEQ missedbonus
11500 CMP R3,#6
11510 BEQ missedbonus
11520 CMP R3,#2
11530 BEQ missedbonus
11540 MOV R0,#0
11550 STR R0,[R1]
11560 MOV R8,#12
11570 BL explo
11580 :
11590 .missedbonus
11600 LDMFD R13!,{R0-R11,PC}
11610 :
11620 .bounce
11630 STMFD R13!,{R0-R11,R14}
11640 LDR R1,[R9,#4]
11650 LDR R2,[R9,#12]
11660 LDR R3,[R9,#52]
11670 LDR R4,[R9,#60]
11680 MOV R5,#5
11690 MUL R3,R5,R3
11700 MUL R4,R5,R4
11710 SUB R1,R1,R3
11720 SUB R2,R2,R4
11730 STR R1,[R9,#4]
11740 STR R2,[R9,#12]
11750 MOV R0,#0
11760 STR R0,[R9,#80]
11770 STR R0,[R9,#52]
11780 STR R0,[R9,#56]
11790 STR R0,[R9,#60]
11800 STR R0,[R9,#64]
11810 LDMFD R13!,{R0-R11,PC}
11820 :
11830 .hitdetect
11840 STMFD R13!,{R0,R2-R11,R14}
11850 MVN R10,#0
11860 :
11870 .loopfindobject
11880 ADD R10,R10,#1
11890 LDR R0,[R11,R10,ASL #objectlength!
og%]
11900 CMP R10,#maxobjects%:BGE miss
11910 CMP R0,#0:BEQ loopfindobject
11920 ADD R8,R11,R10,ASL #objectlengthlc
g%
11930 CMP R8,R9:BEQ self
11940 LDR R5,[R8,#84]
11950 LDR R6,[R8,#4]
11960 LDR R7,[R8,#12]
11970 LDR R2,[R9,#84]
11980 LDR R3,[R9,#4]
11990 LDR R4,[R9,#12]
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WARRIOR TANKS

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12000 ADD R2,R2,R5
12010 SUB R6,R3,R6
12020 SUB R7,R4,R7
12030 MOV R6,R6,ASR #8
12040 MOV R7,R7,ASR #8
12050 MUL R3,R6,R6
12060 MLA R4,R7,R7,R3
12070 CMP R2,R4
12080 MOVGT R1,R8
12090 BGT hit
12100 :
12110 .self
12120 B loopfindobject
12130 :
12140 .miss
12150 MOV R1,#0
12160 :
12170 .hit
12180 LDMFD R13!,{R0,R2-R11,PC}
12190 :
12200 .explo
12210 STMFD R13!,{R0-R11,R14}
12220 LDR R1,[R9,#4]
12230 LDR R2,[R9,#8]
12240 LDR R3,[R9,#12]
12250 SUB R9,R8,#3
12260 :
12270 .anotherpanel
12280 STMFD R13!,{R1-R3}
12290 LDR R11,[R12]
12300 MOV R10,#0
12310 :
12320 .loopfindfree3
12330 ADD R10,R10,#1
12340 LDR R0,[R11,R10,ASL #objectlengthl
og%]
12350 CMP R10,#maxobjects%:BGE binfull3
12360 CMP R0,#0:BNE loopfindfree3
12370 ADD R11,R11,R10,ASL #objectlengthl
og%
12380 BL randomnumber
12390 CMP R0,#2048:MOVLE R0,#6:MOVGT R0,
#4:STR R0,[R11]
12400 STR R1,[R11,#4]
12410 STR R2,[R11,#8]
12420 STR R3,[R11,#12]
12430 BL randomnumber:STR R0,[R11,#16]
12440 BL randomnumber:STR R0,[R11,#20]
12450 BL randomnumber:STR R0,[R11,#24]
12460 BL randomnumber:SUB R0,R0,#2^11:MO
V R0,R0,ASL #1:STR R0,[R11,#52]
12470 BL randomnumber:STR R0,[R11,#56]
12480 BL randomnumber:SUB R0,R0,#2^11:MO
V R0,R0,ASL #1:STR R0,[R11,#60]
12490 BL randomnumber:MOV R0,R0,ASR #7:A
DD R0,R0,#38:STR R0,[R11,#64]
12500 BL randomnumber:MOV R0,R0,ASR #4:S
TR R0,[R11,#68]
12510 BL randomnumber:MOV R0,R0,ASR #4:S
TR R0,[R11,#72]
12520 BL randomnumber:MOV R0,R0,ASR #4:S
TR R0,[R11,#76]
12530 :
12540 .binfull3
12550 LDMFD R13!,{R1-R3}
12560 SUB R8,R8,#1
12570 CMP R8,#0:BGT anotherpanel
12580 LDR R0,[R12,#72]:CMP R0,#0:BNE ski
psound
12590 CMP R9,#3:MOVLT R9,#3
12600 MOV R0,#2
12610 MVN R1,R9
12620 MOV R2,#50
12630 MOV R3,#100
12640 SWI "Sound_Control"
12650 :
12660 .skipsound
12670 LDMFD R13! {R0-R11,PC}
12680 :
12690 .loadinfo
12700 STMFD R13!,{R14}
12710 ADR R12,info
12720 LDMFD R13!,{PC}
12730 .info
12740 ]
12750 FOR loop=1 TO 100
12760 [OPT pass%
12770 EQUD 0
12780 ]
12790 NEXT loop
12800 :
12810 [OPT pass%
12820 ]
12830 NEXT pass%
12840 ENDPROC
12850 :
12860 DEF PROCobjectsetup
12870 FOR loop=0 TO maxobjects%-1
12880 !(objectbuffer+loop*objectlength%)
=0
12890 NEXT loop
12900 :
12910 !(objectbuffer+0)=3
12920 !(objectbuffer+4)=0
12930 !(objectbuffer+8)=20*SC
12940 FOR loop=12 TO 64 STEP 4
12950 !(objectbuffer+loop)=0
12960 NEXT loop
12970 !(objectbuffer+84)=(25*F)^2
12980 mem=1
12990 :
13000 FOR z%=1 TO 14
13010 !(objectbuffer+(mem*objectlength%)
)=(RND(2)-1)*4+1
13020 !(objectbuffer+(mem*objectlength%)
+4)=(RND(6000)-3000)*SC
13030 !(objectbuffer+(mem*objectlength%)
+8)=0
13040 !(objectbuffer+(mem*objectlength%)
+12)=(RND(6000)-3000)*SC
13050 !(objectbuffer+(mem*objectlength%)
+16)=4096/2
13060 !(objectbuffer+(mem*objectlength%)
+20)=RND(4096)-1
13070 !(objectbuffer+(mem*objectlength%)
+24)=0
13080 !(objectbuffer+(mem*objectlength%)
+40)=4096/2
13090 :
13100 FOR loop=44 TO 80 STEP 4
13110 !(objectbuffer+(mem*objectlength%)
+loop)=0
13120 NEXT loop
13130 !(objectbuffer+(mem*objectlength%)
+84)=(13*F)^2
13140 mem+=1
13150 NEXT z%
13160 :
13170 FOR z%=1 TO level%
13180 !(objectbuffer+(mem*objectlength%)
)=3
13190 !(objectbuffer+(mem*objectlength%)
+4)=(RND(8000)-4000)*SC
13200 !(objectbuffer+(mem*objectlength%)
+8)=0
13210 !(objectbuffer+(mem*objectlength%)
+12)=(RND(8000)-4000)*SC
13220 !(objectbuffer+(mem*objectlength%)
+16)=4096/2
13230 !(objectbuffer+(mem*objectlength%)
+20)=RND(4096)-1
13240 !(objectbuffer+(mem*objectlength%)
+24)=0
13250 !(objectbuffer+(mem*objectlength%)
+40)=4096/2
13260 FOR loop=44 TO 80 STEP 4
13270 !(objectbuffer+(mem*objectlength%)
+loop)=0
13280 NEXT loop
13290 !(objectbuffer+(mem*objectlength%)
+84)=(15*F)^2
13300 mem+=1
13310 NEXT z%
13320 ENDPROC
13330 :
13340 DEF PROCtablesetup
13350 mem=0
13360 FOR angle=0 TO (2.5*PI) STEP (PI*2
)/4096
13370 !(sin+mem)=SIN(angle)*2^30
13380 mem+=4
13390 NEXT angle
13400 :
13410 FOR loop=1 TO 4096*4
13420 !(perspective+(loop*4))=(4096/(loo
p/700))
13430 NEXT loop
13440 :
13450 READ numobj
13460 FOR loop=1 TO numobj
13470 mem=(loop-1)*1024
13480 READ num
13490 !(cord+mem)=num
13500 mem+=16
13510 FOR loop2=1 TO num
13520 READ X,Y,Z
13530 !(cord+mem)=X*F
13540 !(cord+mem+4)=Y*F
13550 !(cord+mem+8)=Z*F
13560 mem+=16
13570 NEXT loop2
13580 NEXT loop
13590 :
13600 DATA 7
13610 DATA 8, -10,0,10, 10,0,10, 10,0,-1
0, -10,0,-10, -3,30,3, 3,30,3, 3,30,-3,
-3,30,-3
13620 DATA 8, -4,-4,4, 4,-4,4, 4,-4,-4,
-4,-4,-4, -4,4,4, 4,4,4, 4,4,-4, -4,4,-4
13630 DATA 24, 6,0,14, 6,0,-14, -6,0,-14
, -6,0,14, 8,3,17, 8,3,-16, -8,3,-16, -8
,3,17, 4,7,0, 4,7,-11, -4,7,-11, -4,7,0,
 3,10,-2, 3,11,-10, -3,11,-10, -3,10,-2
13640 DATA 1,8,15, 1,8,-.5, -1,8,-.5, -1
,8,15, 1,9,15, 1,9,-1, -1,9,-1, -1,9,15
13650 DATA 4, 3,-3,0, 3,3,0, -3,3,0, -3,
-3,0
13660 DATA 8, -9,0,9, 9,0,9, 9,0,-9, -9,
0,-9, -9,100,9, 9,100,9, 9,100,-9, -9,10
0,-9
13670 DATA 4, 6,-6,0, 3,3,0, -4,4,0, -3,
-3,0
13680 DATA 18, 0,5,13, 11,5,7, 11,5,-7,
0,5,-13, -11,5,-7, -11,5,7, 0,0,6, 5,0,3
, 5,0,-3, 0,0,-6, -5,0,-3, -5,0,3, 0,10,
6, 5,10,3, 5,10,-3, 0,10,-6, -5,10,-3, -
5,10,3
13690:
13700 FOR loop=1 TO numobj
13710 mem=(loop-1)*1024
13720 READ num
13730 !(facet+mem)=num
13740 mem+=16
13750 FOR loop2=1 TO num
13760 READ P1,P2,P3,P4
13770 !(facet+mem)=P1-1
13780 !(facet+mem+4)=P2-1
13790 !(facet+mem+8)=P3-1
13800 !(facet+mem+12)=P4-1
13810 mem+=16
13820 NEXT loop2
13830 NEXT loop
13840 :
13850 DATA 6, 1,2,3,4, 1,5,6,2, 2,6,7,3,
 3,7,8,4, 4,8,5,1, 8,7,6,5
13860 DATA 6, 1,2,3,4, 1,5,6,2, 2,6,7,3,
 3,7,8,4, 4,8,5,1, 8,7,6,5
13870 DATA 19, 1,2,3,4, 1,5,6,2, 2,6,7,3
, 3,7,8,4, 4,8,5,1, 5,9,10,6, 6,10,11,7,
 7,11,12,8, 8,12,9,5, 9,13,14,10, 10,14,
15,11, 11,15,16,12, 12,16,13,9, 13,16,15
,14, 19,23,24,20, 24,23,22,21, 21,22,18,
17, 17,18,19,20, 20,24,21,17
13880 DATA 2, 1,2,3,4, 4,3,2,1
13890 DATA 6, 1,2,3,4, 1,5,6,2, 2,6,7,3,
 3,7,8,4, 4,8,5,1, 8,7,6,5
13900 DATA 2, 1,2,3,4, 4,3,2,1
13910 DATA 16, 7,8,9,10, 10,11,12,7, 1,2
,8,7, 2,3,9,8, 3,4,10,9, 4,5,11,10, 5,6,
12,11, 6,1,7,12, 1,13,14,2, 2,14,15,3, 3
,15,16,4, 4,16,17,5, 5,17,18,6, 6,18,13,
1, 16,15,14,13, 18,17,16,13
13920 :
13930 FOR loop%=0 TO 4095
13940 !(rndangle+loop%*4)=RND(4096)-1
13950 NEXT loop%
13960 :
13970 FOR loop%=0 TO 1024-1
13980 !(dots+loop%*4)=(RND(8000)-4000)
13990 NEXT loop%
14000 ENDPROC
14010 :
14020 DEF PROCswop
14030 IF screen%=1 screen%=2:GOTO 14080
ELSE screen%=1
14040 *FX112,1
14050 *FX113,2
14060 ENDPROC
14070 :
14080 *FX112,2
14090 *FX113,1
14100 ENDPROC
14110 :
14120 DEF PROCtitles(mesg$)
14130 COLOUR 14
14140 PRINT TAB(33,1)"Warrior Tank"
14150 COLOUR 12
14160 PRINT TAB(20,3)"by   Stuart Cupit
and Simon Cruse"
14170 PRINT TAB(18,6)"Todays highest lev
el....";highlevel;"  by  ";name$
14180 PRINT TAB(27,8)"Z........Turn left
"
14190 PRINT TAB(27,9)"X........Turn righ
t"
14200 PRINT TAB(27,10)"'........Move for
wards"
14210 PRINT TAB(27,11)"?........Move bac
kwards"
14220 PRINT TAB(27,12)"Return...Fire can
non"
14230 PRINT TAB(23,28)mesg$
14240 ENDPROC
```

IMAGE PROCESSING

```
   1Ø REM >Image #3
   2Ø REM find and calculate areas of ob
jects
   3Ø REM by David Knell
   4Ø REM for all Acorn machines
   5Ø REM (c) BAU aug 199Ø
   6Ø :
   7Ø ON ERROR REPORT:PRINT" at line ";E
RL:PROCend:END
   8Ø PROCinit
   9Ø :
  1ØØ REM Generate some objects
  11Ø :
  12Ø MODE 4
  13Ø :
  14Ø MOVE 4Ø,24
  15Ø MOVE 4Ø,224
  16Ø PLOT 85,24Ø, 224
  17Ø :
  18Ø MOVE 3ØØ,24
  19Ø MOVE 3ØØ,124
  2ØØ PLOT 85,4ØØ,24
  21Ø PLOT 85,4ØØ,124
  22Ø :
  23Ø MOVE 15Ø,3ØØ
  24Ø MOVE 1ØØ,35Ø
  25Ø PLOT 85,2ØØ,35Ø
  26Ø PLOT 85,15Ø,4ØØ
  27Ø :
  28Ø FOR d%=Ø TO 9Ø
  29Ø s%=6Ø*SINRAD(d%)
  3ØØ c%=6Ø*COSRAD(d%)
  31Ø MOVE 3ØØ-s%,3ØØ-c%
  32Ø DRAW 3ØØ+s%,3ØØ-c%
  33Ø MOVE 3ØØ-s%,3ØØ+c%
  34Ø DRAW 3ØØ+s%,3ØØ+c%
  35Ø NEXT d%
  36Ø :
  37Ø MOVE 16Ø,1ØØ
  38Ø MOVE 16Ø,12Ø
  39Ø PLOT 85,18Ø,12Ø
  4ØØ :
  41Ø DIM p% 4ØØ
  42Ø :
  43Ø PROCfindblobs(1ØØ,1ØØ,p%)
  44Ø PROCend
  45Ø :
  46Ø MODE Ø
  47Ø *type results
  48Ø :
  49Ø END
  5ØØ :
  51Ø REM Flood-remove (used to delete a
n object from
  52Ø REM an image after it has been ana
lysed)
  53Ø REM Call with PROCremoveblob(x%, y
%)
  54Ø REM where (x%, y%) is the position
 of any point
  55Ø REM in the blob.
  56Ø :
  57Ø DEF PROCremoveblob(x%,y%)
  58Ø LOCAL left%,right%,i%
  59Ø :
  6ØØ left%=x%:right%=x%
  61Ø :
  62Ø IF FNreadpixel(x%,y%)=Ø THEN ENDPR
OC
  63Ø REPEAT
  64Ø PROCwritepixel(left%,y%,Ø)
  65Ø left%=left%-1
  66Ø UNTIL FNreadpixel(left%,y%)=Ø
  67Ø REPEAT
  68Ø PROCwritepixel(right%,y%,Ø)
  69Ø right%=right%+1
  7ØØ UNTIL FNreadpixel(right%,y%)=Ø
  71Ø :
  72Ø i%=left%
  73Ø PROCremoveblob(i%,y%-1)
  74Ø PROCremoveblob(i%,y%+1)
  75Ø i%=i%+1
  76Ø IF i%<=right% GOTO 73Ø
  77Ø ENDPROC
  78Ø :
  79Ø REM Find the edge of a blob in the
 image
  8ØØ REM Call with FNFindContour(x%, y%
 p%) where
  81Ø REM x% and y% give the start point
 of the contour
  82Ø REM p% points to an area of memory
 in which the contour found
  83Ø REM will be returned.
  84Ø REM Returns the number of points f
ound.
```

Continued ▶

IMAGE PROCESSING

◀ Continued

```
850 :
860 DEF FNfindcontour(x%,y%,p%)
870 LOCAL i%,dir%,pts%,sx%,sy%,tx%,ty%last%,start%
880 :
890 last%=FALSE
900 start%=TRUE
910 dir%=0
920 pts%=0
930 tx%=x%
940 ty%=y%
950 :
960 REPEAT
970 FOR i%=dir% TO dir%+7
980 IF FNreadpixel(tx%+dx%(i% AND 7),ty%+dy%(i%AND 7))=0 THEN NEXT i%:=0
990 i%=i% AND 7
1000 tx%=tx%+dx%(i%)
1010 ty%=ty%+dy%(i%)
1020 IF last% AND tx%=sx% AND ty%=sy% THEN=pts%-1
1030 p%?pts%=i%
1040 pts%=pts%+1
1050 dir%=(i%+5) AND 7
1060 IF start% THEN start%=FALSE :sx%=tx%:sy%=ty%
1070 last%=tx%=x% AND ty%=y%
1080 i%=100:NEXT:REM Avoid "Too many FORs"
1090 UNTIL FALSE
1100 =0
1110 :
1120 REM Functions to calculate various aspects of a blob
1130 :
1140 DEF FNblobarea(p%,len%)
1150 LOCAL x%,y%,x1%,y1%,i%,area
1160 x%=0:y%=0:area=0
1170 :
1180 FOR i%=0 TO len%
1190 x1%=x%+dx%(p%?i%)*aspectx%
1200 y1%=y%+dy%(p%?i%)*aspecty%
1210 area=area+(x%*y1%-x1%*y%)/2.0
1220 x%=x1%
1230 y%=y1%
1240 NEXT i%
1250 =area
1260 :
1270 DEF FNblobperimeter(p%,len%)
1280 LOCAL perim
1290 perim=0
1300 :
1310 FOR i%=0 TO len%
1320 perim=perim+SQR((aspectx%*dx%(p%?i%))^2+(aspecty%*dy%(p%?i%))^2)
1330 NEXT i%
1340 =perim
1350 :
1360 DEF FNferetdiameter(p%,len%,rot)
1370 LOCAL x,y,maxx,sr,cr,i%
1380 x=0:y=0
1390 maxx=0
1400 sr=SIN(rot):cr=COS(rot)
1410 :
1420 FOR i%=0 TO len%
1430 x=x+cr*dx%(p%?i%)*aspectx%+sr*dy%(p%?i%)*aspecty%
1440 y=y+cr*dy%(p%?i%)*aspecty%-sr*dx%(p%?i%)*aspectx%
1450 IF x<0 THEN maxx=maxx-x:x=0
1460 IF x>maxx THEN maxx=x
1470 NEXT i%
1480 =maxx
1490 :
1500 DEF PROCblobCOG(p%,len%)
1510 LOCAL i%,x%,y%,x1%,y1%
1520 x%=0:y%=0
1530 cogx=0:cogy=0
1540 :
1550 FOR i%=0 TO len%
1560 x1%=x%+dx%(p%?i%)*aspectx%
1570 y1%=y%+dy%(p%?i%)*aspecty%
1580 cogx=cogx+x%*x%*(y1%-y%)/2
1590 cogy=cogy+y%*y%*(x%-x1%)/2
1600 x%=x1%
1610 y%=y1%
1620 NEXT i%
1630 ENDPROC
1640 :
1650 REM Process a blob
1660 :
1670 DEFPROCprocessblob(x%,y%,p%)
1680 LOCAL len%,i%,str$,oldf%
1690 :
1700 len%=FNfindcontour(x%,y%,p%)
1710 PROCremoveblob(x%,y%)
1720 area=FNblobarea(p%,len%)
1730 perim=FNblobperimeter(p%,len%)
1740 :
1750 PROCblobCOG(p%,len%)
1760 cogx=x%*aspectx%+cogx/area
1770 cogy=y%*aspecty%+cogy/area
1780 :
1790 short=10^10
1800 long=0
1810 FOR i%=0 TO 7
1820 feret(i%)=FNferetdiameter(p%,len%,i%*PI/8)
1830 NEXT i%
1840 FOR i%=0 TO 7
1850 IF feret(i%)>long THEN long=feret(i%):longp=feret((i%+4) AND 7)
1860 IF feret(i%)<short THEN short=feret(i%):shortp=feret((i%+4) AND 7)
1870 NEXT i%
1880 :
1890 IF NOT(EVAL(acceptexp1$) AND EVAL(acceptexp2$)) THEN ENDPROC
1900 :
1910 user1=EVAL(userexp1$)
1920 user2=EVAL(userexp2$)
1930 :
1940 sp$=STRING$(8,CHR$(32))
1950 oldf%=@%
1960 @%=&10207
1970 str$=RIGHT$(sp$+STR$(area),8)+RIGHT$(sp$+STR$(perim),8)
1980 str$=str$+RIGHT$(sp$+STR$(cogx),8)+RIGHT$(sp$+STR$(cogy),8)
1990 str$=str$+RIGHT$(sp$+STR$(short),8)+RIGHT$(sp$+STR$(long),8)
2000 str$=str$+RIGHT$(sp$+STR$(shortp),8)+RIGHT$(sp$+STR$(longp),8)
2010 str$=str$+RIGHT$(sp$+STR$(user1),8)+RIGHT$(sp$+STR$(user2),7)
2020 @%=oldf%
2030 PROCwriteline(str$)
2040 :
2050 ENDPROC
2060 :
2070 REM Search an image for blobs, processing each one.
2080 REM Call with PROCFindBlobs(maxx%, maxy%, p%), where maxx% and maxy%
2090 REM give the size of the image. p% should point to an area of memory
2100 REM big enough for the largest contour to be stored.
2110 :
2120 DEF PROCfindblobs(maxx%,maxy%,p%)
2130 LOCAL x%,y%,last%,pix%
2140 :
2150 last%=0
2160 FOR y%=0 TO maxy%
2170 FOR x%=0 TO maxx%
2180 GCOL3,1
2190 PLOT69,x%*2,y%*4
2200 PLOT69,x%*2,y%*4
2210 pix%=FNreadpixel(x%,y%)
2220 IFlast%=0 AND pix%=1 THEN PROCprocessblob(x%,y%,p%)
2230 last%=pix%
2240 NEXT x%
2250 NEXT y%
2260 ENDPROC
2270 :
2280 REM Initialise required global variables and open results file
2290 :
2300 DEF PROCinit
2310 LOCAL i%
2320 DIM dx%(7),dy%(7),feret(7)
2330 :
2340 FOR i%=0 TO 7
2350 dx%(i%)=SGN(INT(2*SIN((i%-1)*PI/4)+0.1))
2360 dy%(i%)=SGN(INT(2*COS((i%+3)*PI/4)+0.1))
2370 NEXT i%
2380 :
2390 REM We can adjust these to allow working with non-square pixels
2400 REM and in any units we choose: these are set for OS units from
2410 REM a MODE 4 screen.
2420 :
2430 aspectx%=4
2440 aspecty%=4
2450 :
2460 REM Initialise user variables and expressions
2470 :
2480 user1=0
2490 user2=0
2500 userexp1$="user1+area"
2510 userexp2$="0"
2520 :
2530 REM Initialise acceptance conditions for objects
2540 :
2550 acceptexp1$="area>500"
2560 acceptexp2$="TRUE"
2570 :
2580 REM Open output file and write headline
2590 :
2600 file%=OPENOUT("Results")
2610 IF file%=0 THEN PRINT "Couldn't open results file": END
2620 time%=TIME
2630 PROCwriteline("User1    = "+userexp1$)
2640 PROCwriteline("User2    = "+userexp2$)
2650 PROCwriteline("Accept 1 = "+acceptexp1$)
2660 PROCwriteline("Accept 2 = "+acceptexp2$)
2670 PROCwriteline("")
2680 PROCwriteline("    Area   Perim  COG:X  COG:Y  Short    Long  ShortP  LongP  User1  User2")
2690 PROCwriteline("    ====   =====  =====  =====  =====    ====  ======  =====  =====  =====")
2700 PROCwriteline("")
2710 ENDPROC
2720 :
2730 REM Terminate cleanly: close output file, etc.
2740 :
2750 DEF PROCend
2760 :
2770 PROCwriteline("")
2780 PROCwriteline("Run took "+STR$((TIME-time%)/100)+" secs")
2790 CLOSE#file%
2800 ENDPROC
2810 :
2820 REM Write a line of text to the output file
2830 :
2840 DEF PROCwriteline(str$)
2850 LOCAL i%
2860 :
2870 IF LEN(str$)=0 THEN BPUT#file%,10:ENDPROC
2880 FOR i%=1 TO LEN(str$)
2890 BPUT#file%,ASC(MID$(str$,i%))
2900 NEXT i%
2910 BPUT#file%,10
2920 ENDPROC
2930 :
2940 REM Mode 4 read and write pixel
2950 :
2960 DEF FNreadpixel(x%,y%)=POINT(x%*4,y%*4)
2970 :
2980 DEF PROCwritepixel(x%,y%,c%)
2990 GCOL 0,c%
3000 PLOT 69,x%*4,y%*4
3010 ENDPROC
3020 LOCAL left%,right%,i%
```

BEEB MANDELBROTS

Listing 1

```
10 REM ManAssm (FastBrots#1)
20 REM Generate 'ManCode'
30 REM by James Ward
40 REM for B/B+/M/C
50 REM (c) BAU Aug 1990
60 :
70 REM Page must be set to &2100
80 :
90 MODE 7
100 IF PAGE<&2100 THEN PRINT "Page must be set to &2100.  Reload.":STOP
110 :
120 code=&1900
130 acc=&70:opa=&77:opb=&7B:alo=&8E
140 :
150 a=&82:b=&900:x=&86:y=&8A
160 h=&921:v=&922
170 :
180 sl=&905:ci=&909:cr=&90D:rl=&911
190 il=&915:xs=&919:ys=&91D
200 :
210 ctr=&923:itr=&924:odd=&925
220 evn=&926:plt=&904
230 pt=2^23
240 :
250 FOR pass=0 TO 2 STEP 2
260 P%=code
270 [OPT pass
280 .mandelbrot
290 SEI
300 :
310 .init
320 LDA #&00:STA h:STA v
330 :
340 .gencr
350 LDA h
360 JSR writeacc
370 LDA xs:STA opa
380 LDA xs+1:STA opa+1
390 LDA xs+2:STA opa+2
400 LDA xs+3:STA opa+3
410 JSR multiply
420 LDA rl:STA opa
430 LDA rl+1:STA opa+1
440 LDA rl+2:STA opa+2
450 LDA rl+3:STA opa+3
460 JSR add
470 LDA acc:STA cr
480 LDA acc+1:STA cr+1
490 LDA acc+2:STA cr+2
500 LDA acc+3:STA cr+3
510 :
520 .genci
530 LDA v
540 JSR writeacc
550 LDA ys:STA opa
560 LDA ys+1:STA opa+1
570 LDA ys+2:STA opa+2
580 LDA ys+3:STA opa+3
590 JSR multiply
600 LDA il:STA opa
610 LDA il+1:STA opa+1
620 LDA il+2:STA opa+2
630 LDA il+3:STA opa+3
640 JSR add
650 LDA acc:STA ci
660 LDA acc+1:STA ci+1
670 LDA acc+2:STA ci+2
680 LDA acc+3:STA ci+3
690 :
700 .pixel
710 JSR iterate
720 LDA plt
730 BEQ nopoint
740 JSR plot
750 :
760 .nopoint
770 INC v:LDA v
780 CMP #&80
790 BEQ nextcol
800 JMP gencr
810 :
820 .nextcol
830 LDA #&00:STA v
840 INC h
850 LDA h
860 CMP #&50
870 BEQ finished
880 JMP gencr
890 :
900 .finished
910 CLI
920 RTS
930 :
940 .writeacc
950 STA acc+3
960 LDA #&00:STA acc
970 STA acc+1
980 STA acc+2
990 LSR acc+3
1000 ROR acc+2
1010 RTS
1020 :
1030 .plot
1040 LDA ctr:TAX
1050 LDA ctab,X
1060 ASL A:TAX
1070 LDA data,X:STA odd
1080 LDA data+1,X:STA evn
1090 :
1100 .addr
1110 LDA #&00:STA alo+1
1120 LDA h
1130 ASL A:ASL A
1140 ROL alo+1
1150 ASL A
1160 ROL alo+1
1170 STA alo
1180 LDA v
1190 LSR A:LSR A
1200 TAX
1210 LDA atab,X
1220 PHA
1230 LDY #&00
1240 TXA
1250 AND #&01
1260 BEQ nolo
1270 LDY #&80
1280 :
1290 .nolo
```

Continued ▶

◀ Continued

```
1300 TYA:CLC
1310 ADC alo:STA alo
1320 PLA
1330 ADC alo+1:STA alo+1
1340 LDA v:AND #&03
1350 ASL A:CLC
1360 ADC alo:STA alo
1370 LDA alo+1:ADC #&ØØ
1380 STA alo+1
1390 :
14ØØ .write
1410 LDY #&ØØ:LDA evn
1420 STA (alo),Y
1430 INY
1440 LDA odd
1450 STA (alo),Y
1460 RTS
1470 :
1480 .iterate
1490 LDA #&ØØ:STA ctr
15ØØ STA x
1510 STA x+1
1520 STA x+2
1530 STA x+3
1540 STA y
1550 STA y+1
1560 STA y+2
1570 STA y+3
1580 :
1590 .xsquare
16ØØ JSR xaccopa
1610 JSR multiply
1620 LDA acc:STA a
1630 LDA acc+1:STA a+1
1640 LDA acc+2:STA a+2
1650 LDA acc+3:STA a+3
1660 :
1670 .ysquare
1680 LDA y:STA acc:STA opa
1690 LDA y+1:STA acc+1:STA opa+1
17ØØ LDA y+2:STA acc+2:STA opa+2
1710 LDA y+3:STA acc+3:STA opa+3
1720 JSR multiply
1730 LDA acc:STA b
1740 LDA acc+1:STA b+1
1750 LDA acc+2:STA b+2
1760 LDA acc+3:STA b+3
1770 :
1780 .aplusb
1790 LDA a:STA opa
18ØØ LDA a+1:STA opa+1
1810 LDA a+2:STA opa+2
1820 LDA a+3:STA opa+3
1830 JSR add:LDA sl:STA opa
1840 LDA sl+1:STA opa+1
1850 LDA sl+2:STA opa+2
1860 LDA sl+3:STA opa+3
1870 JSR subtract
1880 :
1890 .test
19ØØ LDA #&ØØ:STA plt
1910 LDA acc+3
1920 BMI twoxy
1930 INC plt
1940 :
1950 .twoxy
1960 JSR xaccopa
1970 JSR add
1980 LDA y:STA opa
1990 LDA y+1:STA opa+1
2ØØØ LDA y+2:STA opa+2
2Ø1Ø LDA y+3:STA opa+3
2Ø2Ø JSR multiply
2Ø3Ø LDA ci:STA opa
2Ø4Ø LDA ci+1:STA opa+1
2Ø5Ø LDA ci+2:STA opa+2
2Ø6Ø LDA ci+3:STA opa+3
2Ø7Ø JSR add
2Ø8Ø LDA acc:STA y
2Ø9Ø LDA acc+1:STA y+1
21ØØ LDA acc+2:STA y+2
2110 LDA acc+3:STA y+3
2120 LDA a:STA acc
2130 LDA a+1:STA acc+1
2140 LDA a+2:STA acc+2
2150 LDA a+3:STA acc+3
2160 LDA b:STA opa
2170 LDA b+1:STA opa+1
2180 LDA b+2:STA opa+2
2190 LDA b+3:STA opa+3
22ØØ JSR subtract
2210 LDA cr:STA opa
2220 LDA cr+1:STA opa+1
2230 LDA cr+2:STA opa+2
2240 LDA cr+3:STA opa+3
2250 JSR add
2260 LDA acc:STA x
2270 LDA acc+1:STA x+1
2280 LDA acc+2:STA x+2
2290 LDA acc+3:STA x+3
23ØØ :
2310 .count
2320 INC ctr
2330 :
2340 .until
2350 LDA plt
2360 BNE exit
2370 LDA ctr
2380 CMP itr
2390 BEQ exit
24ØØ JMP xsquare
2410 :
2420 .exit
2430 RTS
2440 :
2450 .xaccopa
2460 LDA x:STA acc:STA opa
2470 LDA x+1:STA acc+1:STA opa+1
2480 LDA x+2:STA acc+2:STA opa+2
2490 LDA x+3:STA acc+3:STA opa+3
25ØØ RTS
2510 :
2520 .add
2530 CLC
2540 LDA acc:ADC opa:STA acc
2550 LDA acc+1:ADC opa+1:STA acc+1
2560 LDA acc+2:ADC opa+2:STA acc+2
2570 LDA acc+3:ADC opa+3:STA acc+3
2580 RTS
2590 :
26ØØ .subtract
2610 SEC
2620 LDA acc:SBC opa
2630 STA acc
2640 LDA acc+1:SBC opa+1:STA acc+1
2650 LDA acc+2:SBC opa+2:STA acc+2
2660 LDA acc+3:SBC opa+3:STA acc+3
2670 RTS
2680 :
2690 .multiply
27ØØ LDA acc+3
2710 EOR opa+3
2720 PHA
2730 LDA acc+3
2740 AND #&8Ø
2750 BEQ acpm
2760 JSR compacc
2770 :
2780 .acpm
2790 LDA opa+3
28ØØ AND #&8Ø
2810 BEQ oppm
2820 JSR compopa
2830 :
2840 .oppm
2850 LDA acc:STA opb
2860 LDA acc+1:STA opb+1
2870 LDA acc+2:STA opb+2
2880 LDA acc+3:STA opb+3
2890 LDA #&ØØ:STA acc
29ØØ STA acc+1:STA acc+2
2910 STA acc+3:STA acc+4
2920 STA acc+5:STA acc+6
2930 STA opb+4:STA opb+5
2940 STA opb+6
2950 :
2960 .mult
2970 CLC
2980 ROR opa+3
2990 ROR opa+2
3ØØØ ROR opa+1
3Ø1Ø ROR opa
3Ø2Ø BCC roll
3Ø3Ø CLC
3Ø4Ø LDA acc
3Ø5Ø ADC opb
3Ø6Ø STA acc
3Ø7Ø LDA acc+1:ADC opb+1:STA acc+1
3Ø8Ø LDA acc+2:ADC opb+2:STA acc+2
3Ø9Ø LDA acc+3:ADC opb+3:STA acc+3
31ØØ LDA acc+4:ADC opb+4:STA acc+4
3110 LDA acc+5:ADC opb+5:STA acc+5
3120 LDA acc+6:ADC opb+6:STA acc+6
3130 :
3140 .roll
3150 CLC
3160 ROL opb+1:ROL opb+2
3170 ROL opb+3:ROL opb+4
3180 ROL opb+5:ROL opb+6
3190 :
32ØØ .zero
3210 LDA opa
3220 ORA opa+1:ORA opa+2:ORA opa+3
3230 BNE mult
3240 :
3250 .trim
3260 LDA acc+2:AND #&4Ø
3270 PHA:CLC
3280 ROL acc+2:ROL acc+3
3290 ROL acc+4:ROL acc+5
33ØØ ROL acc+6:LDA acc+3:STA acc
3310 LDA acc+4:STA acc+1
3320 LDA acc+5:STA acc+2
3330 LDA acc+6:STA acc+3
3340 :
3350 .round
3360 PLA:BEQ sign
3370 SEC:LDA acc
3380 ADC #&ØØ:STA acc
3390 LDA acc+1
34ØØ ADC #&ØØ:STA acc+1
3410 LDA acc+2:ADC #&ØØ
3420 STA acc+2:LDA acc+3
3430 ADC #&ØØ
3440 STA acc+3
3450 :
3460 .sign
3470 PLA
3480 AND #&8Ø
3490 BEQ done
35ØØ JSR compacc
3510 :
3520 .done
3530 RTS
3540 :
3550 .compacc
3560 SEC
3570 LDA acc:EOR #&FF:ADC #&ØØ:STA acc
3580 LDA acc+1:EOR #&FF:ADC #&ØØ
3590 STA acc+1
36ØØ LDA acc+2:EOR #&FF:ADC #&ØØ
3610 STA acc+2:LDA acc+3:EOR #&FF
3620 ADC #&ØØ
3630 STA acc+3
3640 RTS
3650 :
3660 .compopa
3670 SEC
3680 LDA opa:EOR #&FF:ADC #&ØØ
3690 STA opa:LDA opa+1:EOR #&FF
37ØØ ADC #&ØØ:STA opa+1:LDA opa+2
3710 EOR #&FF:ADC #&ØØ:STA opa+2
3720 LDA opa+3:EOR #&FF:ADC #&ØØ
3730 STA opa+3
3740 RTS
3750 :
3760 .atab
3770 :
3780 ]
3790 :
38ØØ FOR n=Ø TO 31
3810 ?P%=(&3ØØØ+n*64Ø) DIV256
3820 P%=P%+1
3830 NEXT
3840 [.data
3850 OPT FNd("ØØØØ1Ø2Ø4Ø8Ø5ØA")
3860 OPT FNd("1Ø2Ø11221428152A")
3870 OPT FNd("Ø2Ø1Ø3Ø3Ø6Ø9Ø7ØB")
3880 OPT FNd("122113231629172B")
3890 OPT FNd("Ø8Ø4Ø9Ø6ØCØCØDØE")
39ØØ OPT FNd("182419261C2C1D2E")
3910 OPT FNd("ØAØ5ØBØ7ØEØDØFØF")
3920 OPT FNd("1A251B271E2D1F2F")
3930 OPT FNd("2Ø1Ø21122418251A")
3940 OPT FNd("3Ø3Ø31323438353A")
3950 OPT FNd("221123132619271B")
3960 OPT FNd("323133333639373B")
3970 OPT FNd("281429162C1C2D1E")
3980 OPT FNd("383439363C3C3D3E")
3990 OPT FNd("2A152B172E1D2F1F")
4ØØØ OPT FNd("3A353B373E3D3F3F")
4Ø1Ø :
4Ø2Ø .ctab
4Ø3Ø :
4Ø4Ø ]
4Ø5Ø NEXT
4Ø6Ø :
4Ø7Ø *SAVE ManCode 19ØØ 1D69
4Ø8Ø END
4Ø9Ø :
41ØØ DEF FNd(da$)
4110 LOCAL n%
4120 FOR n%=1 TO LENda$ STEP 2
4130 ?P%=EVAL("&"+MID$(da$,n%,2))
4140 P%=P%+1
4150 NEXT
4160 =pass
```

Listing 2

```
10 REM ManDump (Fastbrots#2)
20 REM Creates screendump
30 REM by James Ward
40 REM for B/B+/M/C
50 REM (c) BAU aug 199Ø
60 :
70 MODE 7
80 c%=&15ØØ
90 t%=Ø
100 :
110 FOR n%=1 TO 74
120 READ x$
130 a$=""
140 FOR h%=1 TO LENx$
150 IF MID$(x$,h%,1)="Z" a$=a$+"ØØ" EL
SE a$=a$+MID$(x$,h%,1)
160 NEXT
170 FOR h%=1 TO 15 STEP 2
180 ?c%=EVAL("&"+MID$(a$,h%,2))
190 t%=t%+?c%
200 PRINTTAB(Ø,Ø);t%
210 c%=c%+1
220 NEXT
230 NEXT
250 IF t%<>51952 PRINT"Error in data!"
270 *SAVE M.ManDump 15ØØ 175Ø
290 END
300 :
310 DATA 2Ø2715A9Z8D2515
320 DATA 2Ø51152Ø66152Ø77
330 DATA 152Ø7115EE2515EE
340 DATA 2515A98ØCD2515DØ
350 DATA E72Ø3C156ØZZA9
360 DATA Ø22ØEEFFA91B2Ø9C
370 DATA 15A9332Ø9C15A912
380 DATA 2Ø9C156ØA91B2Ø9C
390 DATA 15A9332Ø9C15A924
400 DATA 2Ø9C15A9Ø32ØEEFF
410 DATA 6ØA91B2Ø9C15A94C
420 DATA 2Ø9C15A97Ø2Ø9C15
430 DATA A9Ø32Ø9C156ØA25Ø
440 DATA A9Z2Ø9C15CADØFA
450 DATA 6ØA9ØA2Ø9C156ØA9
460 DATA Z8D26152ØA7158D
470 DATA 2116EE25152ØA715
480 DATA 8D2216CE25152Ø23
490 DATA 16EE2615A95ØCD26
500 DATA 15DØE16Ø48A9Ø12Ø
510 DATA EEFF682ØEEFF6ØAD
520 DATA 2515ØA4A4A4AØAAA
530 DATA BD6E168570E8BD6E
540 DATA 168571AD2515ØA29
550 DATA Ø7186570857Ø9Z2
560 DATA E671AD26158D1D16
570 DATA A9Z8D1E16ØE1D16
580 DATA ØE1D162E1E16ØE1D
590 DATA 162E1E16A57Ø186D
600 DATA 1D16857Ø9Z2E671
610 DATA A571186D1E168571
620 DATA AØZ8C1F168C2Ø16
630 DATA B17ØA2Ø4ØA2E1F16
640 DATA ØA2E2Ø16CADØF5AE
650 DATA 1F16BDAE16AE2Ø16
660 DATA 187DAE166ØZZZ
670 DATA ZZZØE2116AD21
680 DATA 16ØAØA186D21168D
690 DATA 2116ØE2216AD2216
700 DATA ØAØA186D22168D22
710 DATA 16A9ØA8D6D16AØZ
720 DATA 98186D2116AABDB6
730 DATA 168D6C1698186D22
740 DATA 16AABDB6164A4A4A
750 DATA ØD6C162Ø9C15C8CØ
760 DATA ØADØDD6ØZZZ3Ø
770 DATA 8Ø32Z358Ø37Z3A
780 DATA 8Ø3CZ3F8Ø41Z44
790 DATA 8Ø46Z498Ø4BZ4E
800 DATA 8Ø5ØZ538Ø55Z58
810 DATA 8Ø5AZ5D8Ø5FZ62
820 DATA 8Ø64Z678Ø69Z6C
830 DATA 8Ø6EZ718Ø73Z76
840 DATA 8Ø78Z7B8Ø7DZØ2
850 DATA Ø4Ø6Ø1Ø3Ø5Ø77ØEØ
86Ø DATA EØEØEØEØEØEØEØEØ
870 DATA 6ØEØEØEØEØAØEØEØ
880 DATA CØEØ6ØCØEØEØAØEØ
890 DATA EØ6ØEØCØ2ØEØEØEØ
900 DATA 8Ø6ØEØEØCØAØ6ØAØ
910 DATA CØEØ6Ø8ØEØ6ØAØCØ
920 DATA 4ØEØAØ4ØAØEØ4ØAØ
930 DATA EØ4Ø2ØCØAØ6Ø8Ø6Ø
940 DATA CØ2ØCØAØZEZØEØ
950 DATA ZEZØEZØEØ4Ø8Ø
960 DATA 6Ø8Ø2ØCØ2Ø4Ø8Ø6Ø
970 DATA 2Ø8Ø4ØAZØ4ØAØ4Ø
980 DATA 2Ø8ØZCØ2ZØ8Ø6Ø
990 DATA ZZCØ2Ø4Ø8ØZZ
1ØØØ DATA 2ØCZZZØ6ZØ8Ø
1Ø1Ø DATA 2ZZØ4ZZØ8Ø2Ø
1Ø2Ø DATA Z8ZZZØ4ZZØ
1Ø3Ø DATA Z2ØZZZZZZZ
1Ø4Ø DATA ZZZZZZZZ
```

Listing 3

```
10 REM ManGenr (FastBrots#3)
20 REM Generate initial set
30 REM by James Ward
40 REM B/B+/M/C
50 REM (c) BAU aug 199Ø
60 :
70 MODE 2
80 IF PAGE<&21ØØ THEN PRINT "Page mus
t be &21ØØ.  Reload.":STOP
90 :
100 *LOAD ManCode
110 :
120 pt=2^23
130 :
140 rlo=-2.25
150 rhi=Ø.75
160 ilo=-1.5
170 ihi=1.5
180 it%=4Ø
190 :
200 ctab%=&1D68
210 :
220 FOR n%=Ø TO 255
230 ctab%?n%=(n%+1)MOD63+1
240 NEXT
250 :
260 !&9Ø5=1Ø*pt
```

Continued ▶

BEEB MANDELBROTS

◀ Continued

```
270 !&911=rlo*pt
280 !&915=ihi*pt
290 !&919=(rhi-rlo)/80*pt
300 !&91D=(ilo-ihi)/128*pt
310 ?&924=it%
320 CALL&1900
330 :
340 *SVFRM S.ManBrot
350 END
```

Listing 4

```
10 REM Compres (Fastbrots#4)
20 REM Generates LDFRM and SVFRM
30 REM B/B+/M/C
40 REM by James Ward
50 REM (c) BAU aug 1990
60 :
70 alo=&70:pix=&72:len=&73
80 alt=&74:chn=&75:opt=&76
90 xlo=&77:ylo=&79:hlo=&7B
100 wlo=&7D
110 :
120 osfind=&FFCE
130 osbput=&FFD4
140 osbget=&FFD7
150 oswrch=&FFEE
160 :
170 FOR pass=0 TO 2 STEP 2
180 P%=&900
190 [OPT pass
200 .save
210 CLC:LDA &F2:ADC #&06
220 TAX
230 LDA &F3:ADC #&00
240 TAY
250 LDA #&80
260 JSR osfind
270 BNE sok
280 :
290 .saveerror
300 BRK
310 OPT FNb(&2D)
320 OPT FNs("Unable to write file")
330 BRK
340 :
350 .sok
360 STA chn:LDA #&00:STA alo
370 LDA #&30:STA alo+1
380 :
390 .enco
400 LDY #&00
410 LDA (alo),Y
420 STA pix
430 :
440 .scan
450 INY:INY
460 LDA (alo),Y
470 CMP pix
480 BNE done
490 CPY #&00
500 BNE scan
510 INC alo+1
520 :
530 .done
540 TYA:STA len
550 CLC
560 ADC alo:STA alo
570 LDA alo+1:ADC #&00
580 STA alo+1
590 :
600 .bitmap
610 CPY #&02
620 BNE dump
630 LDA pix:ORA #&80
640 LDY chn
650 JSR osbput
660 JMP again
670 :
680 .dump
690 LDA pix:LDY chn:JSR osbput
700 LDA len:JSR osbput
710 :
720 .again
730 LDA alo+1:CMP #&80
740 BNE enco
750 :
760 .xywh
770 LDY chn:LDX #&00
780 :
790 .tran
800 LDA &77,X
810 JSR osbput
820 INX:CPX #&08
830 BNE tran
840 LDY chn:LDA #&00
850 JSR osfind
860 RTS
870 ]
880 NEXT
890 *SAVE SVFRM 900+FF
900 :
910 FOR pass=0 TO 2 STEP 2
920 P%=&900
930 [OPT pass
940 .load
950 LDY #&05
960 :
970 .repl
980 INY
990 LDA (&F2),Y
1000 STA name-6,Y
1010 CMP #&20:BEQ gotit
1020 CMP #&0D:BNE repl
1030 LDA #&00:STA opt
1040 JMP open
1050 :
1060 .gotit
1070 LDA #&0D
1080 STA name-6,Y
1090 INY
1100 LDA (&F2),Y
1110 STA opt
1120 :
1130 .open
1140 LDA #name MOD256:TAX
1150 LDA #name DIV256:TAY
1160 LDA #&40:JSR osfind
1170 BNE lok
1180 :
1190 .loaderror
1200 BRK
1210 OPT FNb(&2D)
1220 OPT FNs("Sorry, can't find that")
1230 BRK
1240 :
1250 .lok
1260 STA chn:LDA #&16:JSR oswrch
1270 LDA #&02:JSR oswrch
1280 LDA #&00:STA alo:LDA #&30
1290 STA alo+1
1300 :
1310 .deco
1320 LDY chn:JSR osbget
1330 BCS exit
1340 STA pix:AND #&80
1350 BEQ othr
1360 LDA pix:AND #&7F
1370 STA pix
1380 LDA #&02:STA len
1390 JMP conv
1400 :
1410 .othr
1420 JSR osbget
1430 BCS exit
1440 STA len
1450 :
1460 .conv
1470 LDA pix
1480 AND #&AA
1490 LSR A
1500 STA alt
1510 LDA pix
1520 AND #&55
1530 ASL A
1540 ORA alt
1550 STA alt
1560 LDY #&00
1570 :
1580 .plot
1590 LDA pix:STA (alo),Y:INY
1600 LDA alt:STA (alo),Y:INY
1610 CPY len
1620 BNE plot
1630 :
1640 .incr
1650 CPY #&00
1660 BNE skip
1670 INC alo+1
1680 :
1690 .skip
1700 TYA:CLC
1710 ADC alo:STA alo
1720 LDA alo+1:ADC #&00:STA alo+1
1730 CMP #&80
1740 BNE deco
1750 :
1760 .exit
1770 LDA opt
1780 CMP #ASC("R")
1790 BNE nobox
1800 JSR box
1810 :
1820 .nobox
1830 LDY chn
1840 LDA #&00
1850 JSR osfind
1860 RTS
1870 :
1880 .box
1890 LDY chn
1900 LDX #&00
1910 :
1920 .modat
1930 JSR osbget
1940 BCS endbox
1950 STA &77,X
1960 INX
1970 CPX #&08
1980 BNE modat
1990 LDA #&19:JSR oswrch
2000 LDA #&04:JSR oswrch
2010 LDX xlo:LDY xlo+1
2020 JSR double
2030 LDX ylo:LDY ylo+1
2040 JSR double:JSR draw:JSR zero
2050 LDX hlo:LDY hlo+1
2060 JSR double:JSR draw
2070 LDX wlo:LDY wlo+1
2080 JSR double:JSR zero:JSR draw
2090 JSR zero
2100 LDX hlo:LDY hlo+1
2110 JSR negate:JSR double:JSR draw
2120 LDX wlo:LDY wlo+1
2130 JSR negate:JSR double:JSR zero
2140 :
2150 .endbox
2160 RTS
2170 :
2180 .double
2190 TXA:JSR oswrch
2200 TYA:JSR oswrch
2210 RTS
2220 :
2230 .draw
2240 LDX #&19:LDY #&01
2250 JSR double
2260 RTS
2270 :
2280 .zero
2290 LDA #&00
2300 JSR oswrch:JSR oswrch
2310 RTS
2320 :
2330 .negate
2340 CLC:TXA
2350 EOR #&FF:ADC #&01
2360 TAX:TYA
2370 EOR #&FF:ADC #&00
2380 TAY
2390 RTS
2400 :
2410 .name
2420 :
2430 ]
2440 NEXT
2450 *SAVE LDFRM 900+150
2460 :
2470 END
2480 :
2490 DEF FNb(a%)
2500 ?P%=a%
2510 P%=P%+1
2520 =pass
2530 :
2540 DEF FNs(a$)
2550 $P%=a$
2560 P%=P%+LENa$+1
2570 =pass
```

Listing 5

```
10 REM ManFast (FastBrots#5)
20 REM Fast Beeb Mandelbrots
30 REM by James Ward
40 REM for B/B+/M/C
50 REM (c) BAU aug 1990
60 :
70 IF PAGE<&2100 THEN PRINT "Page mus
be set to &2100.  Reload.":STOP
80 :
90 *LOAD ManCode
100 :
110 DIM temp &20
120 pt=2^23
130 rlo=-2.25
140 rhi=0.75
150 ilo=-1.5
160 ihi=1.5
170 it%=32
180 g%=0
190 ctab%=&1D68
200 FOR n%=0 TO 255
210 ctab%?n%=(n%+1)MOD63+1
220 NEXT
230 :
240 *LDFRM S.ManBrot
250 PROCrectangle
260 PROCsavescreen
270 :
280 REPEAT
290 MODE7
300 PRINT"Last plot saved as:";~g%-1'
310 PRINT"Rlo:";rlo'"Rhi:";rhi
320 PRINT"Ilo:";ilo'"Ihi:";ihi'
330 PRINT"X:";rlo'"Y:";ilo
340 PRINT"S:";rhi-rlo'
350 *FX21,0
360 :
370 REPEAT
380 INPUT"Iterations (32):"it%
390 UNTIL it%>9
400 :
410 MODE2
420 VDU23;8202;0;0;0;
430 PROCiterate
440 VDU7
450 PROCrectangle
460 PROCsavescreen
470 UNTIL g%=16
480 END
490 :
500 DEF PROCiterate
510 !&905=10*pt
520 !&911=rlo*pt
530 !&915=ihi*pt
540 !&919=(rhi-rlo)/80*pt
550 !&91D=(ilo-ihi)/128*pt
560 ?&924=it%
570 CALL&1900
580 ENDPROC
590 :
600 DEF PROCrectangle
610 return%=FALSE:tab%=FALSE
620 at%=FALSE
630 x=0:y=0:w=320:h=256
640 *FX4,1
650 :
660 REPEAT
670 PROCrt(x,y,w,h,3)
680 PROCrt(x,y,w,h,3)
690 IF INKEY-&62 AND x>0 x=x-16
700 IF INKEY-&43 AND x<1280-w x=x+16
710 IF INKEY-&69 AND y>0 y=y-8
720 IF INKEY-&49 AND y<1024-h y=y+8
730 IF INKEY-&3A w=w+16:h=h+12.8
740 IF INKEY-&2A w=w-16:h=h-12.8
750 IF INKEY-&38 PROCdump
760 IF INKEY-&4A return%=TRUE
770 IF INKEY-&48 at%=TRUE
780 IF at% x=0:y=0:w=1280:h=1024
790 UNTIL return% OR at%
800 :
810 PROCdw(&77,x):PROCdw(&79,y)
820 PROCdw(&7B,h):PROCdw(&7D,w)
830 :
840 xr=(rhi-rlo)/1280
850 yr=(ihi-ilo)/1024
860 rhi=rlo+xr*(x+w)
870 rlo=rlo+xr*x
880 ihi=ilo+yr*(y+h)
890 ilo=ilo+yr*y
900 ENDPROC
910 :
920 DEF PROCrt(rx%,ry%,rw%,rh%,gc%)
930 GCOLgc%,7
940 MOVErx%,ry%
950 DRAWrx%+rw%,ry%
960 DRAWrx%+rw%,ry%+rh%
970 DRAWrx%,ry%+rh%
980 DRAWrx%,ry%
990 GCOL0,7
1000 ENDPROC
1010 :
1020 DEF PROCdw(ad%,wd%)
1030 ad%?0=wd% MOD256
1040 ad%?1=wd% DIV256
1050 ENDPROC
1060 :
1070 DEF PROCsavescreen
1080 $temp="SVFRM S.ManScr"+STR$~g%
1090 X%=temp MOD256
1100 Y%=temp DIV256
1110 CALL&FFF7
1120 g%=g%+1
1130 ENDPROC
1140 :
1150 DEF PROCdump
1160 *RUN M.ManDump
1170 *FX3,10
1180 VDU 2
1190 PRINT
1200 PRINT SPC7;"Rlo:";rlo
1210 PRINT SPC7;"Rhi:";rhi
1220 PRINT SPC7;"Ilo:";ilo
1230 PRINT SPC7;"Ihi:";ihi
1240 PRINT
1250 PRINT SPC7;"Iterations:";it%
1260 VDU 3
1270 *FX3,0
1280 ENDPROC
```

ADFS USERS WILL NEED TO CREATE DIRECTORIES $.B & $.M FOR THESE PROGRAMS TO WORK PROPERLY

Listing 1

```
10 REM Best of H & T - listing 1
20 REM Colour Separator
30 REM by M Harwood
40 REM for B/B+/E/M/C
50 REM (c) BAU August 1990
60 :
70 DIM P% 7, B% 4
80 MODE 7
90 PRINT "PICTURE FILE SEPARATOR"'
100 INPUT "Name of picture file : " P$
110 INPUT "Which screen mode : " M%
120 FOR I%=0 TO M%
130 READ H%, V%, A%
140 NEXT
150 :
160 PRINT "Do you have 80k spare on th
e disc?"
170 IF GET AND &DF = ASC "N" THEN PRIN
T "No":END
180 :
190 MODE M%
200 I%=3
210 PROCoscli("LOAD "+P$+" "+STR$~A%)
220 PROCpalette
230 FOR J%=0 TO 1024 STEP V%
240 FOR K%=0 TO 1279 STEP H%
250 IF P%?POINT(K%, J%) THEN GCOL 0, 0
 ELSE GCOL 0, 7
260 PLOT 69, K%, J%
270 NEXT
280 NEXT
290 PROCoscli("SAVE COL"+STR$~I%+" "+S
TR$~A%+" 8000")
300 :
310 FOR I%=0 TO 2
320 PROCoscli("LOAD "+P$+" "+STR$~A%)
330 PROCpalette
340 C%=2^I%
350 FOR J%=0 TO 1024 STEP V%
360 FOR K%=0 TO 1279 STEP H%
370 IF C% AND ((P%?POINT(K%, J%) EOR 7
)MOD 7) THEN GCOL 0, 7 ELSE GCOL 0, 0
380 PLOT 69, K%, J%
390 NEXT
400 NEXT
410 PROCoscli("SAVE COL"+STR$~I%+" "+S
TR$~A%+" 8000")
420 NEXT
430 END
440 :
450 DEF PROCoscli($&700)
460 LOCAL X%,Y%
470 X%=0:Y%=7
480 CALL &FFF7
490 ENDPROC
500 :
510 DEF PROCpalette
520 LOCAL A%, X%, Y%, I%
530 A%=11:X%=B% MOD 256:Y%=B% DIV 256
540 FOR I%=0 TO 7
550 ?B%=I%
560 CALL &FFF1
570 P%?I%=B%?1
580 NEXT
590 ENDPROC
600 :
610 DATA 2, 4, &3000
620 DATA 4, 4, &3000
630 DATA 8, 4, &3000
640 DATA 2, 4, &4000
650 DATA 4, 4, &5800
660 DATA 8, 4, &5800
670 DATA 4, 4, &6000
```

Listing 2

```
10 REM Best of H & T - listing 2
20 REM Tower of Hanoi
30 REM by Martin Phillips
40 REM for BBC B/B+/M/C/E/A/Nimbus wi
th BBCbasic(86)
50 REM (c) BAU August 1990
60 :
70 MODE 1
80 VDU 23,1,0;0;0;0;
90 DIM A% 2000
100 N%=0:D=A%+4
110 !D=&1020300
120 INPUT "Number of discs "F
130 ?A%=0
140 A%?1=F
150 A%?2=0
160 A%?3=0
170 ?D=F
180 PRINT TAB(0,1) "   It should take
";2^F-1;" moves"
190 size%=100/F
200 Y%=size%*8
210 IF Y%>64 THEN Y%=64
220 FOR Q=0 TO F-1
230 PROCdraw(1,Q,Q,1)
240 NEXT Q
250 N%=0
260 PROCproc
270 END
280 :
290 DEF PROCproc
300 LOCAL t
310 IF ?D=0 THEN ENDPROC
320 D?4=?D-1
330 D?5=D?2
340 D?6=D?1
350 D?7=D?3
360 D=D+4
370 PROCproc
380 pi=D?-3
390 t=D?-1
400 PROCdraw(t,(F-?D)-1,(A%?t)-1,0)
410 PROCdraw(pi,F-?D,(A%?pi),1)
420 A%?t=A%?t-1
430 A%?pi=A%?pi+1
440 D?3=D?-2
450 D?2=t
460 D?1=pi
470 PROCproc
480 D=D-4
490 ENDPROC
500 :
510 DEF PROCdraw(pile,n,height,col)
520 IF col=1 THEN N%=N%+1:PRINT TAB(10
,2)N%;" moves"
530 pile=pile-1
540 X%=pile*420+80+size%*n
550 x%=400+pile*420-size%*n
560 GCOL 0,(n MOD 3)+129
570 IF col=0 THEN GCOL0,128
580 VDU 24,X%;Y%*height;x%;Y%*(height+
1)-4;16,26
590 GCOL 0,3
600 ENDPROC
```

Listing 3

```
10 REM print screen function
20 REM by David Atherton and Graham B
ell
30 REM for BBC B/B+/M/C
40 REM (c) Acorn User August 1988
50 :
60 osbyte=&FFF4
70 oswrch=&FFEE
80 evntv =&0220
90 printw=80
100 :
110 FOR pass=0 TO 3 STEP 3
120 P%=&0900
130 :
140 [
150 OPT pass
160 .instal
170 LDA evntv
180 CMP #entry MOD 256
190 BNE notin
200 LDA evntv+1
210 CMP #entry DIV 256
220 BNE notin
230 BRK
240 OPT FNequb(128)
250 OPT FNequs("PrtSc already installe
d")
260 BRK
270 .notin
280 SEI
290 LDX #entry MOD 256
300 LDY evntv
310 STX evntv
320 STY exitv
330 LDX #entry DIV 256
340 LDY evntv+1
350 STX evntv+1
360 STY exitv+1
370 CLI
380 LDA #14
390 LDX #4
400 JSR osbyte
410 RTS
420 :
430 .entry
440 PHP
450 PHA
460 TXA
470 PHA
480 TYA
490 PHA
500 LDA #129
510 LDX #150
520 LDY #255
530 JSR osbyte
540 CPX #255
550 BNE exit
560 LDA #129
570 LDX #254
580 LDY #255
590 JSR osbyte
600 CPX #255
610 BNE exit
620 LDA #13
630 LDX #4
640 JSR osbyte
650 CLI
660 JSR prinsc
670 LDA #14
680 LDX #4
690 JSR osbyte
700 .exit
710 PLA
720 TAY
730 PLA
740 TAX
750 PLA
760 PLP
770 JMP (exitv)
780 :
790 .exitv   OPT FNequw(0)
800 .xpos    OPT FNequb(0)
810 .ypos    OPT FNequb(0)
820 .width   OPT FNequb(0)
830 .wid2    OPT FNequb(0)
840 .lines   OPT FNequb(0)
850 :
860 .prinsc
870 LDA #134
880 JSR osbyte
890 STX xpos
900 STY ypos
910 LDA #30
920 JSR oswrch
930 LDA #135
940 JSR osbyte
950 TYA
960 ASL A
970 TAY
980 LDA size,Y
990 STA width
1000 STA wid2
1010 LDA size+1,Y
1020 STA lines
1030 :
1040 .loop
1050 LDA #135
1060 JSR osbyte
1070 TXA
1080 BNE loop1
1081 LDY #3
1082 JSR rvstest
1083 LDA #135
1084 JSR osbyte
1085 TXA:PHA
1086 LDY #7
1087 JSR rvstest
1088 PLA
1089 BNE loop1
1090 LDA #32
1100 .loop1
1110 JSR princh
1120 JSR movprt
1130 JSR movcur
1140 BNE loop
1150 LDA #12
1160 JSR princh
1170 LDA #31
1180 JSR oswrch
1190 LDA xpos
```

Continued ▶

CLASSIC EIGHT BITS

◀ Continued

```
1200 JSR oswrch
1210 LDA ypos
1220 JSR oswrch
1230 LDA #7
1240 JSR oswrch
1250 RTS
1260 :
1270 .princh
1280 PHA
1290 LDA #3
1300 LDX #10
1310 JSR osbyte
1320 PLA
1330 JSR oswrch
1340 LDA #3
1350 JSR osbyte
1360 RTS
1370 :
1380 .movprt
1390 DEC wid2
1400 BNE nonewl
1410 .newl
1420 DEC lines
1430 LDA width
1440 STA wid2
1450 CMP #printw
1460 BEQ nonewl
1470 LDA #13
1480 JSR princh
1490 LDA #10
1500 JSR princh
1510 .nonewl
1520 RTS
1530 :
1540 .movcur
1550 LDA lines
1560 BEQ nonewc
1570 LDA #9
1580 JSR oswrch
1590 .nonewc
1600 RTS
1601 .rvstest
1602 LDX #4
1603 .rvsloop
1604 LDA rvsdata,Y
1605 JSR oswrch
1606 DEY
1607 DEX
1608 BNE rvsloop
1609 RTS
1610 :
1620 .size
1630 OPT FNequb(80)
1640 OPT FNequb(32)
1650 OPT FNequb(40)
1660 OPT FNequb(32)
1670 OPT FNequb(20)
1680 OPT FNequb(32)
1690 OPT FNequb(80)
1700 OPT FNequb(25)
1710 OPT FNequb(40)
1720 OPT FNequb(32)
1730 OPT FNequb(20)
1740 OPT FNequb(32)
1750 OPT FNequb(40)
1760 OPT FNequb(25)
1770 OPT FNequb(40)
1780 OPT FNequb(25)
1781 .rvsdata
1782 EQUD &11001187
1783 EQUD &11071180
1790 .end
1800 ] NEXT
1810 :
1820 PROCchecksum(&900,end-1,&8FF5)
1830 PRINT "Press I to install or S to save code"
1840 PRINT "After installation, press CTRL COPY"'"for a screen dump"
1850 I%=GET
1860 IF I%=ASC "I" THEN CALL &900
1870 IF I%=ASC "S" THEN PROCoscli("SAVE PRTSC 900 "+STR$~end)
1880 END
1890 :
1900 DEF FNequb(b%)
1910 ?P%=b%
1920 P%=P%+1
1930 =pass
1940 :
1950 DEF FNequw(b%)
1960 ?P%=b% MOD 256
1970 P%?1=b% DIV 256
1980 P%=P%+2
1990 =pass
2000 :
2010 DEF FNequs(b$)
2020 $P%=b$
2030 P%=P%+LEN(b$)
2040 =pass
2050 :
2060 DEF PROCoscli(string$)
2070 DIM X% &FF
2080 Y%=X% DIV 256
2090 $X%=string$
2100 CALL &FFF7
2110 ENDPROC
2120 :
2130 DEF PROCchecksum (start,end,sum)
2140 C%=0
2150 FOR I%=start TO end
2160 C%=C%+?(I%)
2170 NEXT
2180 IF C%=sum THEN ENDPROC
2190 PRINT "Please check listing"
```

Listing 4

```
10 REM Best of H & T - listing 4
20 REM VIEW Splice
30 REM by Andrew Pillidge
40 REM for B/B+/E/M/C + VIEW
50 REM (c) BAU August 1990
60 :
70 MODE 6
80 elk=1
90 IF INKEY-256=elk THEN mkr1=&0054 ELSE mkr1=&0053
100 mkr2=mkr1+2
110 cpr=&0008
120 z=&90
130 FOR pass=0 TO 3 STEP 3
140 P%=&900
150 [OPT pass
160 LDY #0
170 LDA mkr1
180 STA z
190 STA z+8
200 LDA mkr1+1
210 STA z+1
220 STA z+9
230 CMP #0
240 BNE mark2
250 RTS
260 :
270 .mark2
280 LDA mkr2
290 STA z+2
300 STA z+10
310 LDA mkr2+1
320 STA z+3
330 STA z+11
340 CMP #0
350 BNE toploop
360 RTS
370 :
380 .toploop
390 LDA (z),Y
400 BEQ top
410 JSR inctext
420 JMP toploop
430 :
440 .top
450 JSR inctext
460 LDA z
470 STA z+4
480 STA z+12
490 LDA z+1
500 STA z+5
510 STA z+13
520 :
530 LDA z+8
540 STA z
550 LDA z+9
560 STA z+1
570 :
580 .loop
590 LDA (z),Y
600 STA (z+4),Y
610 CMP #128
620 BPL end
630 CMP #11
640 BEQ end
650 JSR inctext
660 JSR incptr
670 LDA z
680 CMP z+2
690 BNE loop
700 LDA z+1
710 CMP z+3
720 BNE loop
730 :
740 .splice
750 LDA z+8
760 STA z
770 LDA z+9
780 STA z+1
790 LDA z+12
800 STA z+4
810 LDA z+13
820 STA z+5
830 LDY #0
840 :
850 .text1
860 LDA (z+4),Y
870 STA (z),Y
880 CMP #13
890 BEQ text2
900 JSR inctext
910 JSR incptr
920 JMP text1
930 :
940 .text2
950 LDA #9
960 STA (z),Y
970 JSR inctext
980 JSR incptr
990 :
1000 .loopt2
1010 LDA (z+2),Y
1020 STA (z),Y
1030 STA z+6
1040 JSR inctext
1050 CLC
1060 LDA z+2
1070 ADC #1
1080 STA z+2
1090 LDA z+3
1100 ADC #0
1110 STA z+3
1120 LDA z+6
1130 CMP #13
1140 BNE loopt2
1150 :
1160 LDA z+2
1170 CMP z
1180 BNE text1
1190 LDA z+3
1200 CMP z+1
1210 BNE text1
1220 :
1230 LDA mkr1
1240 STA cpr
1250 LDA mkr1+1
1260 STA cpr+1
1270 LDA #0
1280 STA mkr1
1290 STA mkr1+1
1300 STA mkr2
1310 STA mkr2+2
1320 .end
1330 RTS
1340 :
1350 .inctext
1360 CLC
1370 LDA z
1380 ADC #1
1390 STA z
1400 LDA z+1
1410 ADC #0
1420 STA z+1
1430 RTS
1440 :
1450 .incptr
1460 CLC
1470 LDA z+4
1480 ADC #1
1490 STA z+4
1500 LDA z+5
1510 ADC #0
1520 STA z+5
```

Continued 

◀ Continued

```
1530 RTS
1540 ]
1550 NEXT pass
1560 :
1570 *SAVE SPLICE 0900+E6
```

Listing 5

```
10 REM Best of H & T - listing 5
20 REM Cut and Paste ROM
30 REM by Brian Ross
40 REM for E/M/C
50 REM (c) BAU August 1990
60 :
70 MODE 7
80 VDU 28,0,24,39,21
90 :
100 code%=&6000
110 osbyte=&FFF4
120 oswrch=&FFEE
130 osasci=&FFE3
140 :
150 vdust=&D0
160 oldes=&275
170 :
180 mode=&355
190 tcx=&318
200 tcy=&319
210 csp=&F6
220 :
230 PROCass
240 PROCcheck
250 PRINT "Press a key to save 'cut'"
260 IF GET
270 OSCLI "SAVE cut 6000 "+STR$~O%+" 8
000 8000"
280 END
290 :
300 DEF PROCass
310 FOR X%=4 TO 6 STEP 2
320 P%=&8000
330 O%=code%
340 [OPT X%
350 .romstrt
360 EQUB 0
370 EQUW 0
380 JMP service
390 EQUB &82
400 EQUB (copyr-romstrt)
410 EQUB 0
420 .message
430 EQUB 13
440 EQUS "Cut and Paste"
450 EQUB 13
460 EQUB 0
470 .copyr
480 EQUB 0
490 EQUS "(C) 1988 Brian Ross"
500 EQUB 0
510 :
520 .service
530 PHA
540 STA temp
550 TXA
560 PHA
570 TYA
580 PHA
590 LDA temp
600 CMP #&15
610 BEQ poll
620 CMP #&09
630 BEQ help
640 CMP #&01
650 BEQ init
660 .exit
670 .anrts
680 PLA
690 TAY
700 PLA
710 TAX
720 PLA
730 RTS
740 :
750 .poll
760 JMP (pollvector)
770 :
780 .help
790 LDA (&F2),Y
800 CMP #13
810 BNE helpout
820 LDY #0
830 .hloop
840 LDA message,Y
850 BEQ helpout
860 JSR osasci
870 INY
880 JMP hloop
890 .helpout
900 JMP exit
910 :
920 .init
930 LDA #22
940 LDX #1
950 JSR osbyte
960 LDA #poll1 MOD 256
970 STA pollvector
980 LDA #poll1 DIV 256
990 STA pollvector+1
1000 LDA #0
1010 STA cflag
1020 JMP exit
1030 :
1040 .poll1
1050 LDA #129
1060 LDX #&FF
1070 LDY #&FF
1080 JSR osbyte
1090 BCC return
1100 LDA #129
1110 LDX #&FE
1120 LDY #&FF
1130 JSR osbyte
1140 BCC return
1150 LDA #129
1160 LDX #&AC
1170 LDY #&FF
1180 JSR osbyte
1190 BCS cutout
1200 LDA #129
1210 LDX #&AB
1220 LDY #&FF
1230 JSR osbyte
1240 BCS pasteout
1250 .return
1260 JMP exit
1270 :
1280 .pasteout
1290 JMP pasteout1
1300 :
1310 .cutout
1320 LDA cflag
1330 BEQ cut
1340 JMP exit
1350 .cut
1360 LDA pollvector
1370 STA ststatus
1380 LDA pollvector+1
1390 STA ststatus+1
1400 LDA #anrts MOD 256
1410 STA pollvector
1420 LDA #anrts DIV 256
1430 STA pollvector+1
1440 JSR savexy
1450 JSR savewindows
1460 LDA #26
1470 JSR oswrch
1480 LDA #cbuff MOD 256
1490 STA csp
1500 LDA #cbuff DIV 256
1510 STA csp+1
1520 JSR sc_size
1530 LDY nxc
1540 DEY
1550 STY maxx
1560 LDY nyc
1570 DEY
1580 STY maxy
1590 LDA #0
1600 STA minx
1610 STA miny
1620 STA xpos
1630 STA ypos
1640 LDA #ASC"*"
1650 STA prc
1660 JSR move_cur
1670 LDA #31
1680 JSR oswrch
1690 LDA xpos
1700 STA minx
1710 STA ulx
1720 JSR oswrch
1730 LDA ypos
1740 STA miny
1750 STA uly
1760 JSR oswrch
1770 LDA #135
1780 JSR osbyte
1790 STX ulc
1800 LDA #ASC"#"
1810 JSR oswrch
1820 JSR move_cur
1830 LDA xpos
1840 STA lrx
1850 LDA ypos
1860 STA lry
1870 INC lrx
1880 INC lry
1890 LDA #31
1900 JSR oswrch
1910 LDA ulx
1920 JSR oswrch
1930 LDA uly
1940 JSR oswrch
1950 LDA ulc
1960 JSR oswrch
1970 LDA uly
1980 STA cuty
1990 .cutl1
2000 LDA ulx
2010 STA cutx
2020 .cutl2
2030 LDA #31
2040 JSR oswrch
2050 LDA cutx
2060 JSR oswrch
2070 LDA cuty
2080 JSR oswrch
2090 LDA #135
2100 JSR osbyte
2110 CPX #&80
2120 BCC notudc
2130 LDX #32
2140 .notudc
2150 TXA
2160 JSR cutstore
2170 INC cutx
2180 LDA cutx
2190 CMP lrx
2200 BNE cutl2
2210 JSR cutel
2220 INC cuty
2230 LDA cuty
2240 CMP lry
2250 BNE cutl1
2260 JSR cutet
2270 LDA #1
2280 STA cflag
2290 JSR getwindows
2300 JSR getxy
2310 LDA ststatus
2320 STA pollvector
2330 LDA ststatus+1
2340 STA pollvector+1
2350 JMP exit
2360 :
2370 .cutstore
2380 LDY #0
2390 STA (csp),Y
2400 INC csp
2410 BEQ csover
2420 RTS
2430 .csover
2440 INC csp+1
2450 RTS
2460 :
2470 .cutel
2480 SEC
2490 LDA csp
2500 SBC #1
2510 STA csp
2520 LDA csp+1
2530 SBC #0
2540 STA csp+1
2550 TXA
2560 ORA #&80
2570 JSR cutstore
2580 RTS
2590 .cutet
2600 LDA #&FF
2610 JSR cutstore
2620 RTS
2630 :
```

Continued ▶

BEST OF HINTS & TIPS

◀ Continued

```
2640 .move_cur
2650 LDA oldes
2660 STA oldess
2670 LDA #1
2680 STA oldes
2690 LDA #31
2700 JSR oswrch
2710 LDA xpos
2720 JSR oswrch
2730 LDA ypos
2740 JSR oswrch
2750 LDA #135
2760 JSR osbyte
2770 STX oldchar
2780 LDA prc
2790 JSR oswrch
2800 LDA xpos
2810 STA oldx
2820 LDA ypos
2830 STA oldy
2840 .mcloop
2850 LDY #30
2860 .rdkde1
2870 LDX #0
2880 .readkde
2890 NOP
2900 NOP
2910 NOP
2920 INX
2930 BNE readkde
2940 DEY
2950 BNE rdkde1
2960 LDA #15
2970 LDA #1
2980 JSR osbyte
2990 .readkl
3000 LDA #&7A
3010 JSR osbyte
3020 CPX #&FF
3030 BEQ readkl
3040 CPX #25
3050 BEQ left
3060 CPX #121
3070 BEQ right
3080 CPX #41
3090 BEQ down
3100 CPX #57
3110 BEQ up
3120 CPX #73
3130 BEQ rrr
3140 JMP mcloop
3150 .rrr
3160 JMP end
3170 .left
3180 LDA xpos
3190 CMP minx
3200 BEQ leover
3210 DEC xpos
3220 .leover
3230 JMP pr_char
3240 .right
3250 LDA xpos
3260 CMP maxx
3270 BEQ riover
3280 INC xpos
3290 .riover
3300 JMP pr_char
3310 .down
3320 LDA ypos
3330 CMP maxy
3340 BEQ doover
3350 INC ypos
3360 .doover
3370 JMP pr_char
3380 .up
3390 LDA ypos
3400 CMP miny
3410 BEQ upover
3420 DEC ypos
3430 .upover
3440 .pr_char
3450 LDA #0
3460 STA mpflag
3470 LDA oldx
3480 CMP xpos
3490 BEQ xsame
3500 LDA #0
3510 STA mpflag
3520 JMP prov
3530 .xsame
3540 LDA #1
3550 STA mpflag
3560 .checky
3570 LDA oldy
3580 CMP ypos
3590 BEQ ysame
3600 LDA #0
3610 STA mpflag
3620 JMP prov
3630 .ysame
3640 LDA #1
3650 STA mpflag
3660 .prov
3670 LDA mpflag
3680 BEQ prov2
3690 JMP mcloop
3700 .prov2
3710 LDA #31
3720 JSR oswrch
3730 LDA oldx
3740 JSR oswrch
3750 LDA oldy
3760 JSR oswrch
3770 LDA oldchar
3780 JSR oswrch
3790 LDA #31
3800 JSR oswrch
3810 LDA xpos
3820 JSR oswrch
3830 LDA ypos
3840 JSR oswrch
3850 LDA #135
3860 JSR osbyte
3870 STX oldchar
3880 LDA prc
3890 JSR oswrch
3900 LDA xpos
3910 STA oldx
3920 LDA ypos
3930 STA oldy
3940 JMP mcloop
3950 .end
3960 LDA #31
3970 JSR oswrch
3980 LDA oldx
3990 JSR oswrch
4000 LDA ypos
4010 JSR oswrch
4020 LDA oldchar
4030 JSR oswrch
4040 LDA oldess
4050 STA oldes
4060 LDY #128
4070 .dl2
4080 LDX #0
4090 .dl2a
4100 NOP
4110 NOP
4120 NOP
4130 INX
4140 BNE dl2a
4150 DEY
4160 BNE dl2
4170 RTS
4180 :
4190 .sc_size
4200 LDA mode
4210 AND #7
4220 TAY
4230 LDA xtable,Y
4240 STA nxc
4250 LDA ytable,Y
4260 STA nyc
4270 RTS
4280 :
4290 .xtable
4300 EQUB 80
4310 EQUB 40
4320 EQUB 20
4330 EQUB 80
4340 EQUB 40
4350 EQUB 20
4360 EQUB 40
4370 EQUB 40
4380 :
4390 .ytable
4400 EQUB 32
4410 EQUB 32
4420 EQUB 32
4430 EQUB 25
4440 EQUB 32
4450 EQUB 32
4460 EQUB 25
4470 EQUB 25
4480 :
4490 .nyc
4500 EQUB 0
4510 .nxc
4520 EQUB 0
4530 :
4540 .pasteout1
4550 LDA cflag
4560 CMP #1
4570 BEQ paste
4580 JMP return
4590 .paste
4600 LDA pollvector
4610 STA ststatus
4620 LDA pollvector+1
4630 STA ststatus+1
4640 LDA #vector MOD 256
4650 STA pollvector
4660 LDA #vector DIV 256
4670 STA pollvector+1
4680 LDA #cbuff MOD 256
4690 STA papo
4700 LDA #cbuff DIV 256
4710 STA papo+1
4720 JMP return
4730 :
4740 .vector
4750 LDA #&80
4760 LDY #&FF
4770 LDX #&FF
4780 JSR osbyte
4790 CPX #0
4800 BNE endpas
4810 JSR getpaste
4820 TXA
4830 CMP #&FF
4840 BEQ switchoff
4850 PHA
4860 AND #&7F
4870 JSR ikb
4880 PLA
4890 BPL endpas
4900 LDA #13
4910 JSR ikb
4920 .endpas
4930 JMP exit
4940 .switchoff
4950 LDA ststatus
4960 STA pollvector
4970 LDA ststatus+1
4980 STA pollvector+1
4990 LDA #0
5000 STA cflag
5010 LDA #&FF
5020 STA cbuff
5030 JMP endpas
5040 .getpaste
5050 LDA papo
5060 STA csp
5070 LDA papo+1
5080 STA csp+1
5090 LDY #0
5100 LDA (csp),Y
5110 TAX
5120 LDA papo
5130 CLC
5140 ADC #1
5150 STA papo
5160 LDA papo+1
5170 ADC #0
5180 STA papo+1
5190 RTS
5200 .ikb
5210 LDX #0
5220 TAY
5230 LDA #&8A
5240 JMP osbyte
5250 :
5260 .savexy
5270 LDA tcx
5280 STA tabx
5290 LDA tcy
5300 STA taby
5310 LDA vdust
5320 STA vduss
5330 ORA #2
5340 AND #&BF
5350 STA vdust
5360 RTS
```

Continued ▶

◀ Continued

```
5370 .getxy
5380 LDA #31
5390 JSR oswrch
5400 SEC
5410 LDA tabx
5420 SBC &308
5430 JSR oswrch
5440 SEC
5450 LDA taby
5460 SBC &30B
5470 JSR oswrch
5480 LDA tabx
5490 STA tcx
5500 LDA taby
5510 STA tcy
5520 LDA vduss
5530 STA vdust
5540 RTS
5550 .savewindows
5560 LDY #0
5570 .swloop
5580 LDA &300,Y
5590 STA swstore,Y
5600 INY
5610 CPY #&10
5620 BNE swloop
5630 RTS
5640 :
5650 .getwindows
5660 LDY #0
5670 LDA #24
5680 JSR oswrch
5690 .gwl1
5700 LDA swstore,Y
5710 JSR oswrch
5720 INY
5730 CPY #8
5740 BNE gwl1
5750 LDA #28
5760 JSR oswrch
5770 .gwl2
5780 LDA swstore,Y
5790 JSR oswrch
5800 INY
5810 CPY #&C
5820 BNE gwl2
5830 LDA #29
5840 JSR oswrch
5850 .gwl3
5860 LDA swstore,Y
5870 JSR oswrch
5880 INY
5890 CPY #&10
5900 BNE gwl3
5910 RTS
5920 :
5930 .swstore
5940 EQUD 0
5950 EQUD 0
5960 EQUD 0
5970 EQUD 0
5980 EQUD 0
5990 :
6000 .cutx
6010 EQUB 0
6020 .cuty
6030 EQUB 0
6040 .ulx
6050 EQUB 0
6060 .uly
6070 EQUB 0
6080 .ulc
6090 EQUB 0
6100 .lrx
6110 EQUB 0
6120 .lry
6130 EQUB 0
6140 .ststatus
6150 EQUW 0
6160 .cflag
6170 EQUB 0
6180 .tabx
6190 EQUB 0
6200 .taby
6210 EQUB 0
6220 .vduss
6230 EQUB 0
6240 .pollvector
6250 EQUW 0
6260 .xpos
6270 EQUB 0
6280 .ypos
6290 EQUB 0
6300 .oldx
6310 EQUB 0
6320 .oldy
6330 EQUB 0
6340 .maxx
6350 EQUB 0
6360 .minx
6370 EQUB 0
6380 .maxy
6390 EQUB 0
6400 .miny
6410 EQUB 0
6420 .prc
6430 EQUB 0
6440 .oldchar
6450 EQUB 0
6460 .mpflag
6470 EQUB 0
6480 .editsts
6490 EQUB 0
6500 .oldess
6510 EQUB 0
6520 .papo
6530 EQUW 0
6540 .temp
6550 EQUB 0
6560 .cbuff
6570 ]
6580 NEXT
6590 ENDPROC
6600 :
6610 DEF PROCcheck
6620 T%=0
6630 FOR X%=code% TO O%
6640 T%=T%+?X%
6650 NEXT
6660 IF T%<>&258D6 THEN VDU 7:PRINT "Ch
ecksum error - Please check listing":END
6670 ENDPROC
```

Listing 6

```
10 REM Best of H & T - listing 6
20 REM Program Datestamper
30 REM by G K Davis
40 REM for Master or B/B+/E/C with RT
C
50 REM (c) BAU August 1990
60 :
70 PROCclearmem
80 PROCassemble
90 PROCchecksum
100 PROCsavecode
110 END
120 :
130 DEF PROCclearmem
140 FOR I%=&A00 TO &A2F
150 ?I%=0
160 NEXT I%
170 ENDPROC
180 :
190 DEF PROCassemble
200 code%=&A00
210 FOR pass=0 TO 3 STEP 3
220 P%=code%
230 [OPT pass
240 LDA #0
250 STA buffer
260 LDA #14
270 LDX #buffer MOD 256
280 LDY #buffer DIV 256
290 JSR &FFF1
300 LDX #255
310 .insert
320 INX
330 LDA remstring,X
340 PHA
350 STX store
360 TAY
370 LDX #0
380 LDA #138
390 JSR &FFF4
400 LDX store
410 PLA
420 CMP #&D
430 BNE insert
440 RTS
450 .remstring
460 OPT FNequs("0REM ")
470 .store
480 OPT FNequb(0)
490 .buffer
500 ]
510 NEXT
520 ENDPROC
530 :
540 DEF PROCchecksum
550 C=0
560 FOR I%=&A00 TO &A2F
570 C=C+?(I%)
580 NEXT I%
590 IF C<>5176 THEN PRINT "Check listi
ng.":END
600 ENDPROC
610 :
620 DEF PROCsavecode
630 PRINT "Press SPACE to save code"
640 REPEAT UNTIL GET=32
650 *SAVE STAMP FFFF0A00+2B
660 ENDPROC
670 :
680 DEF FNequb(b%)
690 ?P%=b%
700 P%=P%+1
710 =pass
720 :
730 DEF FNequs(b$)
740 $P%=b$
750 P%=P%+LEN(b$)
760 =pass
```

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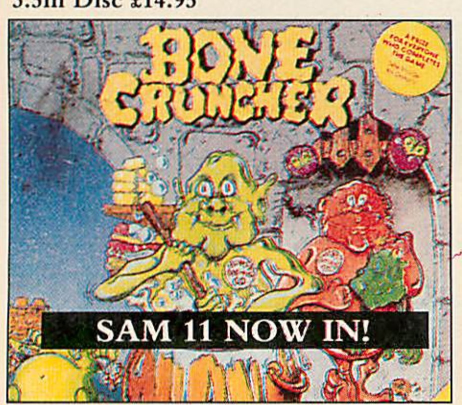
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Sam9 — *Camelot, Steve Davies Snooker, Spycat, The Life Of Repton*

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Cassette £9.95, 5.25in Disc £11.95, 3.5in Disc £14.95



CAN YOU BEAT THE SPORTS PROFESSIONALS AT THEIR OWN GAME?
QUESTION OF SPORT

Play TV's most popular sports quiz, for less than half price!

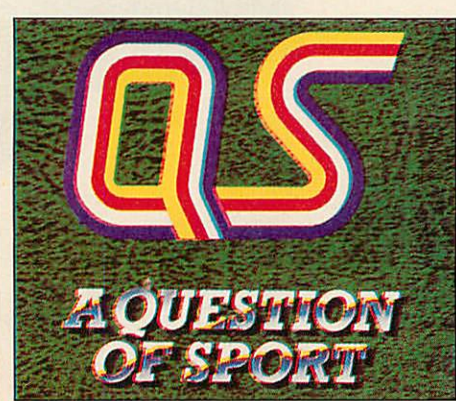
With David Coleman asking the questions and Ian Botham and Bill Beaumont heading up the teams, you can pit your wits against your family and friends, or even challenge your BBC micro.

There are six exciting and fast-moving rounds, including Pictureboard, Mystery Personality and a Quickfire round.

If you've always fancied yourself as a bit of a sports fanatic, this is the program that will thoroughly test your knowledge.

Order your copy today and see if you can beat the professionals at their own game.

	Tape	5.25in	3.5in
RRP	£12.95	£14.95	£19.95
BAU Discount	£6.50	£7.50	£10
Offer Price	**£6.45**	**£7.45**	**£9.95**



ALL THREE TRIVIALPURSUIT AT A TRIVIAL PRICE!

The computer version of *Trivial Pursuit* is faithful to the original board game. The object being to travel around the board answering questions and trying to collect a wedge for each of the six subjects.

The questions are asked by a cute character called TP, while the screen layout shows the board along with the progress of each player.

Don't worry about running out of questions. There are enough in this set to keep you wracking your brains through many sessions.

And for as little as £14.95 we'll send you the complete set of Trivial Pursuit games, including Genus, Baby Boomer and Young Players.

	Cassette	5.25in Disc
RRP	£44.85	£59.85
BAU Discount	£29.90	£39.90
Offer Price	**£14.95**	**£19.95**



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ARCHIMEDES

SEE SUBSCRIPTION OFFER

ZARCH

David Braben, author of *Zarch*, is also the co-author of the unanimously acclaimed game *Elite* – probably the world's highest selling computer game.

After months of program development work, David finally harnessed the speed and performance of the Archimedes computer to create another programming masterpiece.

Zarch is unlike any game you have ever seen before. Even the demonstration program, *Lander*, supplied on the Archimedes Welcome disc, can only give the most basic idea of the features and fascination that *Zarch* has in store.

The three-dimensional landscape is realistically portrayed by skilful use of 256 colours, area shading and accurate perspective design. The multi-directional smooth-scrolling movement is also enhanced by the use of twin screens: one is viewed while the other is updated.

RRP £19.95
BAU Discount £5.00
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REPTON 3

The Repton series of games is the most successful software ever published for the BBC micro and Electron computers and has been described as 'The thinking man's arcade game'.

Now, a massive enhanced version is available for the Archimedes, comprising four complete games:

* REPTON 3 * THE LIFE OF REPTON * AROUND THE WORLD IN 40 SCREENS * REPTON THRU TIME

Enhanced features include a choice of four tunes and a position save/recall facility. In addition the software includes a sophisticated Screen Editor and Character Editor with a choice of 16 colours from a total of 4,096 hues. Plus you can design new screens and immediately test them by entering the game section.



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BAU Discount £5.00
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BBC MICRO / MASTER / ELECTRON

RICOCHET

Ricochet has an amazing 330 different action-packed screens arranged over five levels. You get five games in one, since each level has its own distinctive theme, with superb graphics and unusual puzzles to solve.

You control SPRAT, the Small Partially Robot Alien Time-traveller, in his quest to collect the five hour-glasses from the five worlds of *Ricochet*.

SPRAT can roll left and right and up and down ladders and ropes, but his unique ability is that he can jump to different heights and in different directions. You have to control the fast-moving alien as he ricochets through the levels.



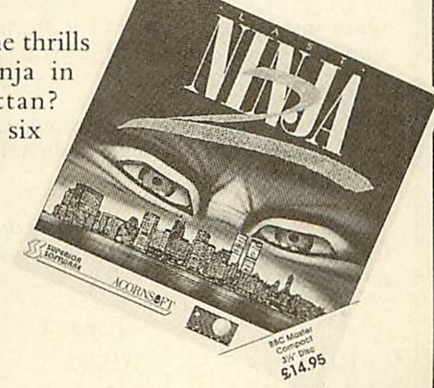
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BAU Discount	£2.00	£2.50	£3.00
Offer Price	£7.95	£9.45	£11.95

LAST NINJA 2

Born in a time of peace, lived in a time of war, the shadow warrior returns. Leaping the abyss of time he comes to fulfil his destiny!

If you enjoyed *The Last Ninja* you'll go crazy over *Last Ninja 2*. There are lots more fiendish adversaries, more colourful screens with superb graphics, a score line, a timer and lots more exciting Ninja action.

Are you ready for the thrills and skills of the Ninja in crime-filled Manhattan? Can you survive the six action-packed levels?



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RRP	£9.95	£11.95	£14.95
BAU Discount	£2.00	£2.50	£3.00
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NOW YOUR BBC MICRO CAN TALK BACK FOR AS LITTLE AS *£4.95!*

Speech! is an incredible piece of coding, needing no extra hardware and taking up just a few K of memory, it converts your BBC's sound chip into a full-blown speech synthesiser!

Once installed you can call it from your own programs with simple-to-use commands. Plus you can fully configure it to speak in any accent or pitch.

And you can teach it how to pronounce unusual words and phrases — adding them to the built-in dictionary — customising ***Speech!*** to your own requirements.

Due to a bulk purchase we can offer this unique program to you for less than half price. But place your order soon as they're sure to be in high demand.

	Tape	*5.25in*	*3.5in*
RRP	£9.95	£11.95	£14.95
BAU Discount	£5	£6	£7.50
Offer Price	**£4.95**	**£5.95**	**£7.45**

Please note: ***Speech!*** is not compatible with the Electron

The program is not supplied in its original packaging but is complete and fully working.

THE TOTAL DTP SOLUTION

For a limited period we are offering *The Publisher* PLUS four extra discs giving a total of 86 different fonts for only £49.95!

The Publisher is a remarkably easy to use and powerful desktop publishing package, featuring its own page description language, allowing you to operate it from within *Wordwise, Wordwise Plus, View, Interword* or *Wordpower,* and giving you total control over the layout of your documents.

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Combined with the 86 fonts, *The Publisher* offers you everything you need to produce professional-looking results — all in one package, and for less than £50!

But remember, this is a limited offer, so to be sure of your *Publisher* kit order your copy soon.

RRP	£105.80
BAU Discount	£55.85
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HARDWARE

We have secured exclusive rights to offer the last few remaining Tandy FP215 Flatbed Plotters at an incredible saving of £400!

We can do this because, although they are superb pieces of equipment, there are only 80 of them left. This offer is therefore on a strictly first come, first served basis.

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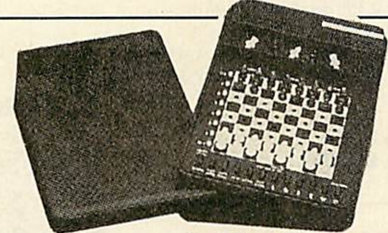
Specially designed so that it fits easily in your pocket or wallet, but opens out to give two manageable sets of keys and a two-line display, the 20k Microdiary is the ideal way to keep your important information instantly to hand.

Forget about paper personal organisers, the Microdiary has no trouble holding even the busiest person's contact list, as well as appointments, reminders, memos and much, much more — and you don't need a pen, or have to buy refill packs of paper each year!

And the best news of all is that for a limited period we have reduced the price of this unique device by £10. For just £39.95 you'll have one of the easiest, cheapest and most secure means of managing your personal data.



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*** 21 definable function keys for quick access**
*** Security code to prevent unwanted access**
*** Paperless "printer" for reviewing entries**
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*** Accurate clock * Alarm function**
*** 10 digit display calculator**
*** 24 World time zones**
*** Memo function**
*** 20k memory**
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If you can't make up a bridge foursome, try the Dual Screen Bridge Computer

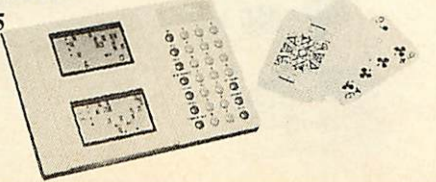
Only slightly larger than a paperback book, yet featuring 28 keys and two displays, the Dual Screen Bridge Computer is the ideal way for you to practice bridge.

Targeted at beginners to intermediate players it will help you improve your skills of bidding, playing and recall. While, if you are an advanced bridge player, the Bridge Computer will help you to keep your hand in.

And for just £49.95, saving £10 off the recommended price, you're sure to find it helps your bridge playing to improve — as well as being a fun pastime you can play anywhere.

*** 4 levels of play**
*** Plays 3 hands**
*** Random cards generated for each hand**
*** You bid against the computer**
*** You can be dummy, declarer or defender**
*** Checks for and disallows illegal play**
*** Displays your cards, the dummy's hand, bidding, playing and vulnerability, and the results of contracts and tricks**
RRP £59.95 BAU Discount £10.00

Offer Price £49.95



The go-anywhere Pocket Chess Plus Computer

This is a truly pocket sized chess computer featuring a touch sensitive board so you can forget about entering fiddly coordinates because the Pocket Plus knows where you move each piece.

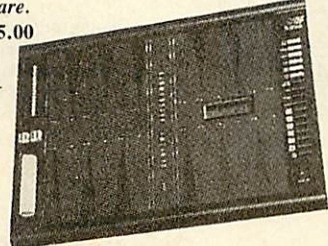
It comes with a comprehensive coaching facility which teaches tactical manoeuvres, warns you if a piece is in danger and even shows you its thinking.

Programmed with several difficulty levels, whether you are a beginner or a master, the Pocket Plus will give you a challenging game — every time. And it even remembers the state of play when you switch it off.

Normally the Pocket Plus sells for £34.95, but if you buy it from us we'll knock £5 off the recommended price. For just £29.95 you're guaranteed hours of enjoyment — where ever you are.

RRP £34.95 BAU Discount £5.00

Offer Price £29.95



Save £15 on the Saitek Sensory Backgammon Computer

This is a superbly presented portable or table-top backgammon computer which, like the chess computer, has a touch sensitive board so that it knows where you move the pieces.

It features 9 levels of play with a quick response program and a fully automatic random dice display. And if you don't want to play the computer you can use the board to play a friend too.

Recommended at £69.95, we have slashed £15 off the price of this superb product. Order yours today for only £54.95.

RRP £69.95 BAU Discount £15.00

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MASTER COMPACT

Brian Clough's Football Fortunes

Brian Clough's Football Fortunes is a football management game with a big difference. In an exciting departure from earlier simulation games it combines an excellent range of computer based features with a fascinating board game.
Can you compete with human and computer managers to successfully steer your team through the season, using your skill to make it stronger as you proceed?
With the program you get a large playing board, over 100 player cards, stacks of money, some counters and a comprehensive instruction manual. And for only £7.99 you're guaranteed hours of inexpensive yet intense, action-packed excitement!

RRP £9.99
BAU Discount £2.00
Offer Price £7.99



Colossus 4 Bridge

Colossus Bridge allows one player to play a complete game of bridge with the computer controlling the other three hands. Each hand is bid according to the Acol system, while other standard conventions are also available.
If you're a beginner at bridge you can make use of the in-built tutor which has 10 specially chosen hands to illustrate the principles of the game.
In fact, for just £10.99, whether you're a beginner or a more advanced player, you'll find Colossus Bridge is the ideal partner, either for practise or when you can't get another three people together for a game.

RRP £14.99
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Tank Attack

Tank Attack is a computerised board game for two, three or four players, where each player takes the role of a General commanding a country's Tank Corps of one or more armoured divisions.
Your objective is to capture the enemy headquarters, which will require the planned strategic deployment of your forces and regular fire duels between your own and enemy units. Weather, morale, skill, judgement, planning, foresight, careful management of rebuild and repair facilities and luck all play a part in deciding the result of each game.

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Birdie Barrage Golf

An excellent golf simulation offering you the chance to play at the famous Turnberry Ailsa, Belfry Brabazon, Carnoustie Championship and Acorn Park golf courses.
All the features you'd expect form a good golf game are here, including woods, water and bunkers.
And for just £7.99 this must be a game that should be in everyone's collection.

RRP £9.99
BAU Discount £2.00
Offer Price £7.99

Colossus 4 Chess

Probably the most complete chess program available for any home computer and written using the very latest techniques, by a computer chess programmer with over eight years experience.
Colossus perfectly understands the rules of chess and can handle all standard mates, while offering you the choice between a two- dimensional flat board or a stunning 3D display.
It comes with a comprehensive instruction manual and must be the best chess program for casual and serious players alike.

RRP £14.99
BAU Discount £4.00
Offer Price £10.99



Steve Davis Snooker

This has to be the best snooker simulation you can buy, which is surely proven by the fact that Steve Davis has endorsed it!
It includes a computer play option, infinitely variable speed, spin, friction factor, break score and a foul shot facility, as well as superb graphics.
If you fancy yourself as a good snooker player, for only £9.99 why not see just how good you are at the computer version.

RRP £12.99
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Offer Price £9.99



Sporting Triangles

No matter what your sporting preferences may be, Sporting Triangles is bound to intrigue, puzzle and frustrate you.
It includes over 2,500 questions to choose from, across 12 action- packed sports.
All the features of the top rating TV quiz show are combined in this superbly presented and equally compelling game.

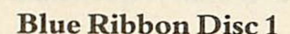
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Football Director

Billed as the ultimate football challenge, Football Director features four leagues with 20 teams each, a 38 game season, home and away matches, FA and League Cups, replays and much, much more.
In fact it's so packed with features it really is almost like the real thing, including player's morale, substitutions, injuries, transfers, promotion and relegation, tax, interest, wages and many more than there are room to print here. At the virtually give-away price of just £9.99 Football Director will give you hours, if not days or weeks, of action-packed excitement.

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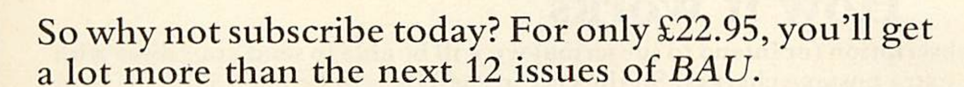
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1. No more than one free gift will be allowed per subscriber per year (unless you renew your subscription early. In which case your free gift will be supplied within 28 days). This means that we will no longer allow people to cancel their subscriptions and then re-subscribe to get another free gift.
2. This offer replaces all previous subscription offers as stocks of free gifts from previous offers are no longer available.
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PLEASE SEE THIS MONTH'S YELLOW PAGES FOR FULL DETAILS

Why not buy the BBC Acorn User monthly disc?

You know that *BBC Acorn User*'s yellow pages consistently bring you the best in new software for your BBC or Archimedes each month.

But why not save the wear and tear on your fingers, and get programs that work the first time by ordering this month's disc.

As usual it's packed with plenty of software for everyone.

NEW LOW PRICES

5.25in disc £4.95
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The Monthly Disc Subscriptions Are Back!

Ever since the expiry of our previous Monthly Disc offer in the January 1990 issued, we have been inundated with requests from readers asking if we can backdate disc subscriptions for them.

We always listen to our readers (after all, it's your magazine) and try to include as many of your suggestions as possible in *BBC Acorn User*. In this case your response has been so overwhelming that we have decided to make the monthly discs available from now onwards — for just the cost of the discs, post and packing.

We are producing this offer at such a low price as a special reader service and there is no time limit or closing date. We hope that in the months and years to come you will make use of, and enjoy, this service which provides a valuable addition to your BBC/Acorn software collection.

How it works

If you currently have a magazine subscription (or intend to subscribe) we will be able to send your discs with the magazine, saving much of any extra postage charges. So the cost in the UK will be just £5 for the next twelve 5.25in discs, or £10 for 3.5in (Making less than 42p each for 5.25in, or 84p for 3.5in).

Here is a breakdown of the prices if we send your discs with the magazine. (Remember that the magazine subscription price is not included):

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Overseas (Airmail)	£19.00	£24.00

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Here are the various worldwide prices:

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VISA / Access

OFFER OF THE MONTH

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SUBSCRIPTIONS

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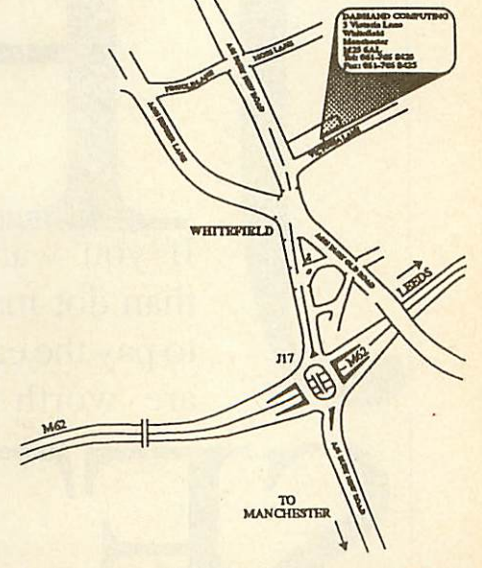
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JET SETTERS

If you want something that is better than dot-matrix output, but don't want to pay the earth for a printer, then inkjets are worth a look. **GEOFF BAINS** explains

When choosing a printer, few people look beyond the obvious choices of dot-matrix and laser printers. Even daisywheel machines rarely get a look-in these days and alternatives such as inkjet printers tend to be ignored.

Mention inkjet printers and most *BAU* readers will think only of the Integrex Colourjet. But there are many more monochrome inkjet printers vying for attention and slowly gaining acceptance against conventional machines.

While dot-matrix printers work by striking the paper through an inked or carbon ribbon, an inkjet printer uses tiny squirts of liquid ink which dry on hitting the paper.

The dots on the paper are always of the same darkness, giving an even image and, unlike an impact dot-matrix printer which prints more and more faintly as its ribbon wears out, an inkjet printer will produce a consistent quality of print until the ink flow finally stops altogether.

Since there are no moving parts, inkjet printers are potentially much faster than their mechanical cousins.

With most models the differences are more theoretical than actual and modern 24-pin dot-matrix machines are faster.

However, the more expensive inkjet printers can match the fastest dot-matrix machines and beat them for quality too.

To fairly compare the speeds of these printers, *BAU* tested them by printing a set piece of text and from this calculated the average speed in characters per second (CPS). This is more realistic than the manufacturers' claimed speeds and can be directly compared between models and with the printers of different types reviewed in previous issues.

The print quality from inkjet printers varies in much the same way as it does for dot-matrix models. The print quality is dependent on the number of dots making up each character. Most dot-matrix printers use nine or 24 pins.

However, it is much easier to fit many tiny nozzles into a tight space than it is to fit large numbers of pin mechanisms and, although cheaper models such as the Siemens PT88S use only nine nozzles, the most expensive inkjet printers are capable of an impressive 360 dots to the inch – better than most laser printers.

The big advantage common to all inkjet printers is that they are quiet. Dot-matrix and daisywheel printers make so much noise that conversation or even concentration in the same room is difficult.

An inkjet printer is almost silent. It is only the printhead moving across the page and the paper feed that makes any noise.

The ink squirted at the paper is a special ink formulated for the particular model of printer.

The replacement ink cartridges are simple to replace – much easier than many dot-matrix printer ribbons – but they tend to be relatively expensive.

They cannot be re-used or refilled and can last for as few as 500,000 characters (only about 200 pages).

The paper used can also make a difference. A package of suitable paper is often included with an inkjet printer but this will not last long and new paper is usually expensive. The print samples included here are made on good but ordinary paper.

Some models do not object to this but others show their true colours under such 'real' conditions.

Inkjet printers are otherwise much like any other type. The compatibility standard they follow is as important as with dot-matrix machines.

Either IBM or Epson standards are preferable for Beeb owners but the higher quality machines are compatible with a subset of Hewlett-Packard's Laserjet laser printer control codes which will find favour with Archimedes and BBC A3000 owners.

Siemens PT88S

```
!"#$%&'()*+,-./012345
6789:;<=>?@ABCDEFGHIJ
KLMNOPQRSTUVWXYZ[\]^_
`abcdefghijklmnopqrst
```

Although well made, this is a simple machine – really it's just an inkjet version of an old-fashioned nine-pin dot-matrix printer.

The printhead has just nine nozzles and the print quality suffers accordingly. It would not be difficult to find a nine-pin printer offering comparable quality to this machine for less than half the price.

The so-called 'near letter quality' (NLQ) mode of printing is little more than the standard draft mode print with each line overprinted with a second pass to make the characters look darker. There is no typewriter lookalike font nor any real improvement in quality.

Admittedly, it would take a more expensive dot-matrix printer to equal the speed of the PT88S but many 24-pin dot-matrix printers of similar price can print faster.

Mechanically, this printer is reasonably strongly made although the plastic covers are flimsy. Both tractor and friction feed (without automatic paper loading) are provided and a wide carriage version (the PT89S) is also available for £100 extra.

The controls are simple in the extreme.

Only line and form feed and on-line switches are there – the bare minimum.

This is partly because, compared to other modern printers, the PT88S is not capable of all that much. This printer is available in Epson or IBM compatible versions but these are only the older FX80 and graphics printer standards, and the PT88S cannot have both emulations fitted at the same time.

Unless the low noise operation is your be all and end all, there can be little to recommend this model. There are both better inkjet and dot-matrix printers available.

Hewlett Packard Thinkjet



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!"#$%&'()*+,-./012345
6789:;<=>?@ABCDEFGHIJ
KLMNOPQRSTUVWXYZ[\]^_
`abcdefghijklmnopqrst
```

The Thinkjet is an extremely small printer. It takes up about the same room on a desk as a piece of A4 paper and is only three or four inches high. It weighs only around 5.5lbs and, although of little interest to Acorn users, it's battery powered and portable. A mains adapter pack for running the printer from the mains is available for £16.

A tractor feed unit is built-in but the friction feed suffers from no automatic paper loading and not even a wind knob! The Centronics interface uses a non-standard socket so a special cable is required. This may be difficult to obtain.

When it comes to performance, the Thinkjet is another basic machine. It has 12 nozzles so it should perform a little better than a normal nine-pin dot-matrix printer and in draft mode it is indeed on par with a cheap dot-matrix machine.

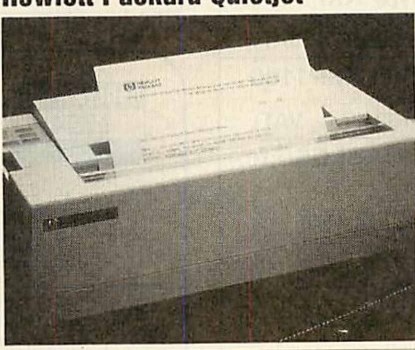
The Thinkjet also has a 'quality' mode which produces darker text. However, again, this is not real NLQ print. It is nothing more than emphasised draft print.

Nor is the Thinkjet particularly fast. What's more, the speeds in table 1 are biased in its favour as the Thinkjet is limited to only 12 characters per inch (CPI) instead of the usual choice of 10 or 12CPI.

The Thinkjet is compatible with the Epson FX range except it cannot produce superscript and subscript characters. It is also compatible with Hewlett Packard's own control code standard. This is not found in many printers and not expected by software. However, it is a (small) subset of the Laserjet laser printer code system.

Like the PT88S, the Thinkjet really misses out on most of the potential of inkjet technology. It is quiet and portable but neither high quality nor exceptionally fast.

Hewlett Packard Quietjet



```
♥♦♣♠!"#$%&'()*+,-./01
23456789:;<=>?@ABCDEF
GHIJKLMNOPQRSTUVWXYZ[
\]^_`abcdefghijklmnop
```

The Quietjet isn't a portable model but it uses a separate mains power supply unit. This same printer is also available from Facit as the J1200 for £569. A wide carriage version (the Hewlett Packard Quietjet Plus or Facit J1250) is available for £689.

This machine has both Centronics and RS232 interfaces, a tractor feed unit and a paper wind knob. It is similar to the Thinkjet and uses the same ink cartridges and a printhead with 12 nozzles to produce similar draft print. However, the NLQ print from this machine is genuinely different. It is a two-pass print with characters designed to look like a typewriter's. The quality, though is still not up to much.

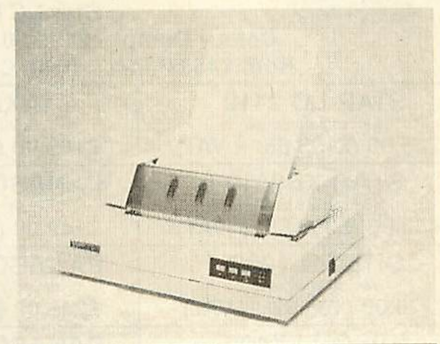
Most surprising, the Quietjet is not at all quiet! Although the printing itself makes next to no noise the cavernous plastic case makes the mechanical noise reverberate.

The Quietjet can print the whole IBM character set and it is compatible with Epson FX control codes as well as Hewlett Packard's own standard.The Quietjet is certainly an improvement over the Thinkjet but even so, it hardly qualifies for choice over a dot-matrix machine.

Mannesmann Tally MT90

The MT90 is not an inkjet but a 'bubble jet' printer. It uses a slightly different technique to produce the tiny squirts of ink but the overall operation is similar.

The quality is unfortunately similar too. The printhead uses 12 nozzles and in draft mode the print, although well formed, is



```
♥♦♣♠!"#$%&'()*+,-./01
23456789:;<=>?@ABCDEF
GHIJKLMNOPQRSTUVWXYZ[
\]^_`abcdefghijklmnop
```

faint, only just readable and printed slowly.

In NLQ mode the print is acceptable but only just. It is a typewriter lookalike font and clearly readable but just as clearly made up of dots. NLQ print is produced at an extremely fast 61CPS. Only dot-matrix machines of twice this price produce NLQ print this fast, but their quality is far better.

The MT90 is a conventional printer in construction and ruggedly made. It has friction and tractor feed mechanisms and a roll paper holder too. No automatic paper loading is provided but an automatic bulk sheet feeder is available as an option.

The MT90 uses IBM compatible control codes and can print the entire IBM character set. Curiously, there is no control code for changing from draft to NLQ mode. This can only be achieved by flicking a Dip switch at the back of the printer and turning the whole machine off and on.

This printer is certainly an improvement over the Siemens and HP models but it still leaves much to be desired and falls well short of the potential of inkjet technology.

Diconix 150 Plus

```
♥♦♣♠!"#$%&'()*+,-./01
23456789:;<=>?@ABCDEF
GHIJKLMNOPQRSTUVWXYZ[
\]^_`abcdefghijklmnop
```

This is another truly tiny machine. It is only as big as a large hardback novel and weighs a trifling 3.75lbs.

It is battery powered, and the batteries are cunningly located inside the paper roller, taking up 'no room'. A mains power supply is also supplied.

The 150 Plus is extremely quiet in use. The only sound it makes is the gentle whirring of gears moving the printhead and paper. There are 12 ink nozzles in the printhead, giving a print quality similar to cheap nine-pin dot-matrix printers but much better than the PT88S or Thinkjet.

There are three print qualities. The draft print is pretty awful – extremely 'dotty'

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50 96tpi D/S D/D in boxes	17.17	19.75
100 96tpi D/S D/D in boxes	32.09	38.90
10 3M High Density 3.5"	25.00	28.75
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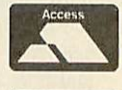
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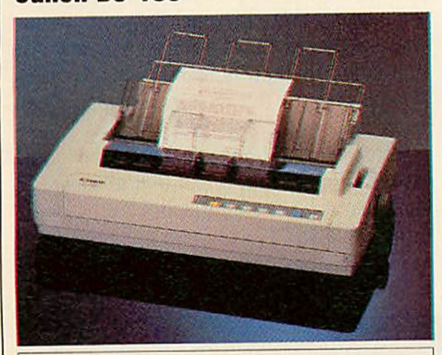
and faint. The NLQ mode is not that much better but the 'Quality' mode is quite reasonable. The Diconix 150 Plus is also not particularly fast. It manages speeds similar to most nine-pin machines costing £150-250.

Both single sheet and fanfold paper can be used although no automatic paper loading is provided and actually getting paper into the printer is a fiddly business. There is no paper wind knob.

The whole printhead along with the ink reservoir is replaced every 500 pages or so. These are easy to fit and cost about £10 a time.The Diconix 150 Plus's controls are simple to operate. Good positive click buttons feed the paper and select the print quality and both Epson FX and IBM Proprinter control codes are used.

For portable printing power, there is nothing to beat the Diconix 150 Plus but that doesn't matter much to Beeb and Arc users. For Acorn use, the Diconix 150 Plus is let down by the quality of print. Even the best 'Quality' mode is bettered by dot-matrix machines costing £100 less. However, it is quiet in the extreme and certainly takes up little enough room on the desk.

Canon BJ-130



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The BJ-130 (also sold by Mannesmann Tally as the MT91) although expensive, really shows the advantages of an inkjet printer. It is another 'bubble jet' but this one uses 48 nozzles in its printhead and the resulting quality is impressive. It can produce 360 dots per inch (more than a laser printer) giving very clear, dense characters.

Even in the so-called draft mode, the print is better than many dot-matrix machines' NLQ mode and in NLQ mode the text is as good as (or better) than a laser printer's and almost impossible to distinguish from typewritten.

The only disadvantage of all this quality is that the £14 ink cartridge lasts for only one million characters (about 400 pages) making the printer expensive to run.

It is as fast as any dot-matrix printer at this kind of price but much better quality. The BJ-130 also has all the frills and features expected of a modern printer. It is a wide carriage machine and while no tractor feed unit comes as standard, for cut sheets a 100-sheet bulk feeder is built-in – an expensive option on most printers.

The control panel allows all the functions of the printer to be easily controlled and clear indicators show what's going on. A flip-down panel at the front of the machine conceals the simple plug-in ink cartridge and two font cartridge slots. These take plug-in font cartridges and a range of character styles are available for £69 each. Also in the front is the 'control capsule'. This is another plug-in module which determines the control code emulation.

IBM Proprinter emulation is included with the machine and an NEC emulation module is available for £35.

Although this is an expensive printer, it has many features which justify the price. It is inkjet printers such as this which will one day take over from impact dot-matrix machines as the 'standard' printer type.

Hewlett Packard Deskjet Plus

The old Deskjet was reviewed in the February 1989 *BAU* and the Deskjet Plus is a slightly improved model. Like the BJ-130/MT91, the Deskjet Plus is a 'bubble jet' printer but it has 56 nozzles in the printhead and these help to produce extremely impressive quality print.

There are two qualities available – draft and NLQ – and both are far in advance of any of the cheaper machines.

One problem is that the paper has a tendency to become a little soaked in ink when large areas of black are printed and this crinkles and can occasionally smudge.

The whole printhead is replaced each time the ink runs out. Since this happens every 500,000 NLQ characters and replacement units cost £15, this is expensive. However, it is a simple operation and it does mean the printhead never wears out.



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This printer can also produce NLQ text faster than any of the others. A range of different NLQ print sizes are available up to about half-inch height. Other sizes and styles come on cartridges for £49 each.

Just Hewlett Packard's own Laserjet-type control codes are used and the Deskjet Plus produces excellent graphics with the Risc OS Laserjet printer driver. For Beeb users Epson FX emulation can also be added with a £78 cartridge.

Like a laser printer, The Deskjet Plus can print in a 'landscape' format, sideways along the paper.

The Deskjet Plus looks quite unlike the other printers. It is large, bulky and more like a photocopier or laser printer in appearance. It is almost entirely made of plastic but it still appears to be strong.

There is no tractor feed built-in nor is one available. Instead it has an almost Heath Robinson collection of rollers and levers which feeds cut sheet paper from a 100-sheet bin through the printer and stacks the sheets neatly (but in reverse order) in an out-tray. Small sheets and envelopes are catered for with a separate mechanism.

The Deskjet Plus is the nearest thing to a laser printer for this price. It doesn't have the speed of a laser printer, but it does offer the quality and many of the features.

Make & model	Price	Print width (cols)	Claimed speed Draft	Claimed speed NLQ	Average speed Draft	Average speed NLQ	Tractor Feed	Sheet Feeder	Auto Load	Emulations Eps	Emulations IBM	Emulations HP	Ink price per million characters
Canon BJ-130	£915	136	220	110	77	56	£46	•	•		•		£14
Facit J1200	£569	80	160	40	93	30	•			•		•	£17
HP Deskjet Plus	£915	80	240	120	93	67		•	•		£78	•	£30
HP Quietjet	£574	80	160	40	93	30	•			•		•	£17
HP Thinkjet	£459	80	150		84		•			•		•	£17
Mannesmann Tally MT90	£569	80	220	110	85	61	•	£144			•		£4
Mannesmann Tally MT91	£915	136	220	110	77	56	£100	•	•		•	•	£23
Siemens PT88S	£574	80	343	114	90	42	•	£190		*	*		£2
Diconix 150 Plus	£459	80	145	29	87	24	•			•	•		£8

All prices are manufacturer's RRP and include VAT

* Either interface supplied

Table 1. A comparative analysis of the models tested

BOARD GAMES

Electronic bulletin boards can give modem owners hours of cheap harmless fun. **DAVID JANDA** called on a few and recommends his personal favourites

After purchasing a modem, the first thing you will want to do is log on to some type of computer. The simplest and cheapest way of doing this is to connect up to an electronic 'bulletin board'. Bulletin boards are abundant in this country, and are crammed with news and information relating to a wide variety of topics.

Even though the boards detailed below have an Acorn 'feel' to them, they greatly vary. The list is by no means comprehensive, and simply represents my own personal choice. Access to the boards mentioned can be done with a modem that operates at 1200/75 baud, and with viewdata-compatible software.

The exception to this is The World of Cryton which requires scrolling software. There are numerous other systems operational within the UK, and numbers for these can be found on most BB's, or periodically within the Comms column which is published each month in *BBBC Acorn User*.

The World of Cryton

The World of Cryton is a BB which all Acorn owners should log on to.

The system is massive. Running on an Archimedes R140 workstation fitted with a 30Mhz Arm 3 chip, the system has over 662Mb of online storage. The board is multi-user, and is accessed on one of two numbers; (0749) 679794 or (0749) 670030. The latter number is for connecting to the system with error correcting modems using any line speed you care to name.

Cryton is a scrolling BB which specialises in the Archimedes. If Ansi terminal mode is used to access the system you can use colour menus and view a selection of animations.

The message area is made up of conferences, some of which are networked. Network mail is gathered from a variety of BBs, and it is possible to send messages to other users on a variety of systems.

The file transfer area is massive. Crammed with PD software, it will be a godsend to any Arc owner who is looking for the latest utility or module tweak.

The system is free of charge to those who just wish to browse around. But download facilities are not available to unregistered users. Subscribing currently costs £10. Subscribers, compared with those who simply register, gain when it comes to 'download ratio'.

Download ratio indicates the amount of information you have to upload to the system in order to download data. In this case a subscriber has to upload one byte for every 100 downloaded. The idea behind all this is to ensure that BB services are two-way streets – everyone has to contribute.

SID



In order to keep its customers and dealers informed, Acorn has set up a support information database called SID. The type of information held on the system varies.

There is news of Acorn related products (hardware and software), official Acorn press releases and system news relating to the board itself.

Software support is also provided with a few megabytes of files for the Archimedes range. For the Arc user SID is a valuable asset, as Acorn places enhanced versions of its modules on the system, together with demo files as well as various text files. You'll also find many of the programs featured in *BBC Acorn User*'s yellow pages on the system.

As SID is operated by the customer support department at Acorn, a number of its staff use the system on a regular basis. This is very handy as the board has several bulletin boards which cover numerous technical subjects such as Risc OS and image manipulation.

Currently there are three ways in which to access SID. Prestel subscribers can use a gateway into the system for a few pence per minute, and Micronet subscribers get the same access, but at a cheaper rate. An alternative method is to register with SID by applying to the customer support department.

After registration you can access the system by calling a direct dial number, or via Fastrak, a communications network similar to PSS.

The customer support department at Acorn can be contacted on (0223) 245200.



The Gnome at Home

As far as Acorn-based viewdata systems go, the Gnome at Home has been online since the year zero. It is, without doubt the most professional system and is run by an enthusiast. The Gnome started life as part of Viewfax 258 which was part of Prestel many moons ago. It moved into its own home shortly after, and since then has grown and grown. In fact, so many people use the Gnome at Home that the sysop has several phone lines running into the system, which is multi-user.

There are public lines for non-subscribers, private lines for subscribers and a line for subscribers who have error correcting modems such as the Demon 4.

The Gnome at Home is very much a user's system. Besides a number of computer-related areas (including the BBC micro and communications) there are a number of babble boards. These are bulletin boards which cover a variety of subjects ranging from role playing games to trivia.

Part of the attraction of the Gnome at Home is that you can edit your own area, which is called a babble board. Editors have access to what is, without doubt, the most sophisticated set of online editing facilities available. Again, subjects covered in these mini-magazines vary from reviews of curry houses to astronomy.

The mailbox facilities are very comprehensive, with online help facilities, enhanced editing and routing, and for editors there's even a real-time on-line message system. Non-subscribers can access the Gnome at Home on 081-888 8894 using conventional viewdata software.

CCL4

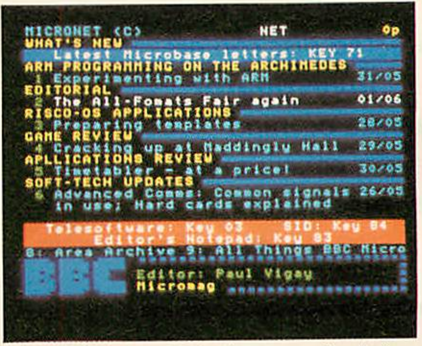


Regular readers of my comms column will have noticed that I have mentioned CCL4 on more than one occasion. The reason for this is that it is one of the most innovative boards I have come across. CCL4 is run by James Lawson, and is based in Hull. The board is of the mode 7 scrolling variety. This means you need to use scrolling terminal software capable of operating in mode 7. Packages such as *Commsoft*, *Zromm* and *Comstar* all have this feature.

If there is a theme to CCL4 then it's music. The board is packed with tunes for the BBC micro, *Ample* and *Music 500/0*. Real time lyrics are often found in the BBC Basic tunes, and there is even a selection of music Roms for sideways Ram users that allow tunes to be played in the background. Digitised samples and pictures can also be found on the system.

Users cannot download to their hearts' content, though. Prior to downloading an item, a message must be left on one of the message boards. The public message section is very active, and can be trivial at times. The downside of this is that when looking for your own messages you must first wade through all the new messages left since you last logged on. CCL4 is on (0482) 655798.

Micronet



Although not a BB in the sense that it is a commercial service, Micronet does deserve to be covered as it has catered for BBC micro users for over five years.

Micronet is part of the Prestel database, and was set up to provide an online interactive medium for computer enthusiasts. It has evolved over the years to cover a wide range of entertainment-related subjects but still has a large base of subscribers who use Acorn machines.

For the Acorn owner there is the BBC Microbase, which has regular updates throughout the week, and probably the most active online letters page with at least 20 new messages per day. Throughout the week Acorn-related features and reviews appear, and if you have a problem relating to your machine you can be sure someone will be able to help you.

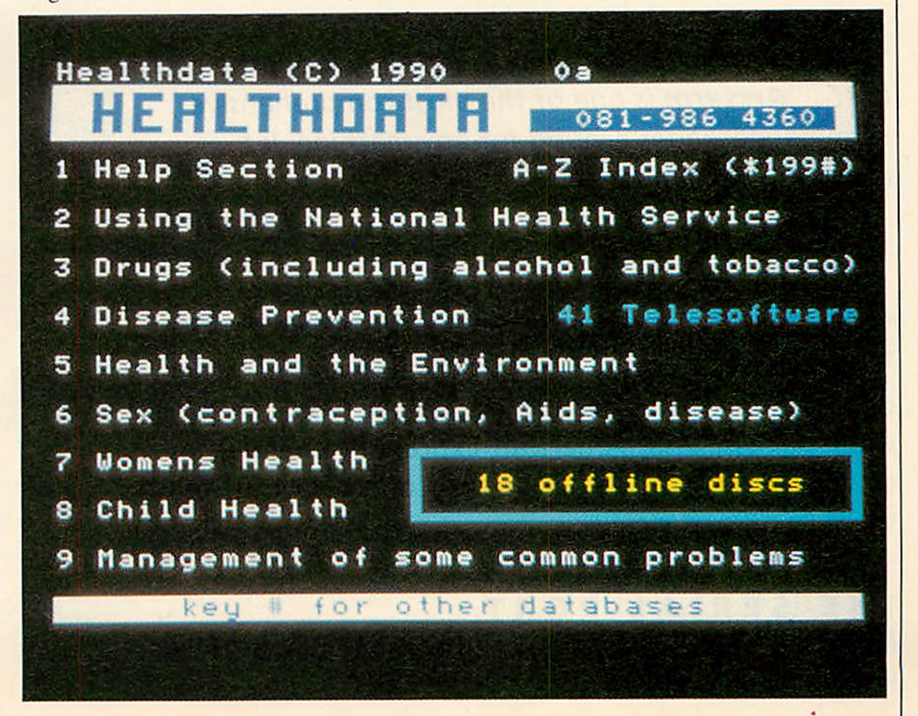
The BBC telesoftware section was at one time one of the most active to be found on any system, but since the removal of chargeable telesoftware it has died down a bit. Having said that, there are still dozens of programs to be found on the system, and the editor of the BBC Microbase is always on the lookout for public domain titles.

At around £80 for a year's subscription Micronet is quite expensive. However, the sub also gives you access to the rest of Prestel. On the plus side (cost wise) Prestel can be accessed anywhere within the UK with a local call. Micronet also provides a number of subscription deals at certain times of the year, and can sell you a subscription which includes a free modem to get you going. Micronet is on (0442) 237237.

Healthdata

On the whole, bulletin boards cater for computer enthusiasts, and those with specialist interests such as adventure playing, music and the like. However, life is not all fun and games, and there are some boards which provide valuable information.

One such board is Healthdata, which is Communitel-based BB run on a network of computers by Dr Chris Dobbing. The board brings preventative medicine to anyone with



a modem. The free service operates on a 24 hour basis, seven days a week and uses commands similar to Prestel. Finding your way around the database is easy as each section is routed, and a complete A-Z index is also provided.

Dr Dobbing is providing the service in order to 'promote positive health', and judging by the number of health-related topics covered in the database he appears to be doing just that.

Subjects covered range from using the National Health Service to sex-related topics. Other areas cover drugs, child health and disease prevention, to name a few. Each sub-section is packed with information that is written in a clear, concise manner, and can be understood by children and adults alike. Indeed, Healthdata has been adapted to fit in with the new GCSE Biology course.

The board has a mailbox system which can be used to send messages to the sysop, and a public bulletin board area. Dr Dobbing also provides an off-line version of the entire database.

Of course nobody should use the Healthdata database as an alternative to going to their own GP, but it does provide a valuable service for schools and individuals. Healthdata is on 071-986 4360.

Swafax 1 and 3

The Swafax boards are operated from a school, and are noted for their contribution for providing satellite weather pictures for BBC model B owners some time ago.

The boards are 'green' in that they specialise in the weather; what it is, pictures of it and such like. Swafax 1 is a viewdata based BB which runs on the Autonomic System Host as developed by the sysop of

The Gnome at Home. Available on (0622) 850440, the system has a gateway into its sister board Swafax 2.

The system has topic related bulletin areas, a puzzle area and a BB list. A further gateway into the Heathern Realm is also provided as well as a weather section and weather logger. The latter gives (when it's turned on) pressure and temperature readings in a graphical format.

The weather section provides clear descriptions of what the weather is, and another section called 'What On Earth?' provides information on deforestation, the greenhouse effect, unleaded petrol, ozone layer and a news section.

On a machine-specific level Swafax also provides a number of regularly updated satellite weather pictures which can be downloaded with Cet of Xmodem. The mode 1 pictures are compressed and require a decompactor (also available) to uncrunch them. Pictures are updated on a regular basis during term time, and besides providing pictures of the British Isles and surrounding areas, other global weather patterns are available. These pictures can be viewed on a black and white monitor, or dumped to a printer for best results.

Phantom Towers

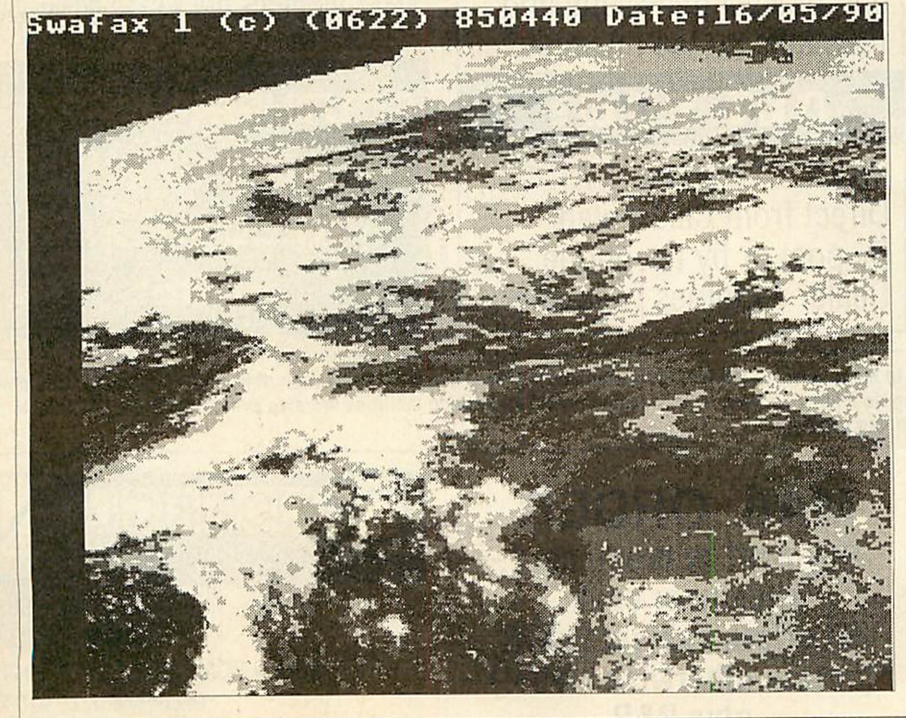
A special mention must go to Phantom Towers, because it is sadly closing.

This viewdata board (under a different name) was one of the first to cater for Archimedes owners three years ago. The Sysop then changed the name of the board to Phantom Towers because he felt it was time to 'move on'.

Currently the board has a very healthy bulletin area called the mega-loop. Once logged on the caller can hop on the message loop at the latest message, and keying 2 will display previous messages, while keying 1 moves you forward.

Many features found on other boards were first introduced on Phantom Towers, and the sysop produces a regular viewdata newsletter which is posted to registered users if they have a Prestel mailbox. In the letter he gives the latest information on what's happening with Phantom.

Phantom will be closed during the summer while the sysop develops the new Phantom BB. Meanwhile, Phantom Towers is on (0226) 340425. Registration is free.



KNOW YOUR STUFF

Facts are often not enough – they need organising. LAWRENCE BRIGHTMAN takes a fresh look at an old problem

The free text database *Knowledge Organiser*, recently released by Clare's Micro Supplies, is a rewrite of the original *Arc-TFS* by Sean O'Conhail. Although it is compatible with databases which were created with *Arc-TFS*, the upgrade has significantly increased both the utility and appearance of the original.

The package is installed on the menu bar in Risc OS, and once it is clicked on, the application is run. It takes full possession of the keyboard and screen from other applications when run, and returns them when exited. It requires a minimum of 1Mb of Ram, running under Risc OS on either an Arc or BBC A3000 computer.

Knowledge Organiser can be used with either floppies or hard discs. The size of any database, located in a directory, is specified when created by an installation procedure which requires the adjustment of a number of parameters.

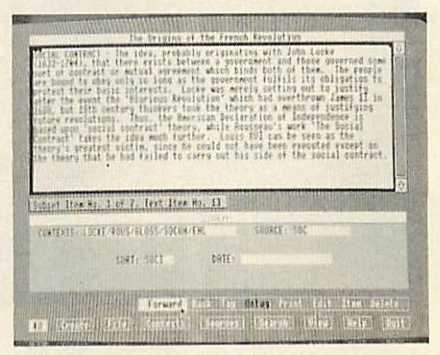
Adjustment of the parameters is done by use of the mouse only; it would have been more convenient to allow direct keyboard entry of the sizes. Six parameters can be changed, all affecting the amount of space required for each database. They are:

1. The maximum length allowed for context code explainers. As each code is created, an explainer field is linked to that code, which allows a full explanation of what the code means.
2. The number of context codes to be used in the database.
3. Maximum permissible length of the source code descriptions.
4. The number of sources to be filed.
5. The average length of each of the text items.
6. The number of text items for the database.

Source codes can be 10 characters in length, while context (keyword) codes can be six characters each. Further user-defined search/data (linker) fields can be specified, and the length and placement of their fields on the screen are determined by the user, using the mouse. Floppies can contain up to 650,000 characters of text when using *Knowledge Organiser*. Hard discs can contain more, to the full extent of their capacity. Both ADFS and SCSI hard discs are supported. Ram discs can also be used.

Although the average length and number of text fields are specified during the installation process, *Knowledge Organiser* is flexible in allowing either longer or shorter entries, up to a maximum of 200 lines.

Knowledge Organiser will also directly search files which have been created using Clare's *Graphic Writer*, Acorn's *First Word Plus* or Colton's *Pipedream*, or any Ascii files, although it will only display the first 200 lines of each file. In fact, a very sophisticated text referencing system could be established using *Knowledge Organiser* in connection with any of the above wordprocessors or Ascii files, with Risc OS allowing easy access both ways between *Knowledge Organiser* and the wordprocessor. No editing is allowed of these non-Ascii files, but Ascii files can be edited within *Knowledge Organiser*. Text printing of the first 200 lines of each file is possible as well.



Searches can be conducted using any of the fields defined for that database. One field is specified at a time, but additional searches can be done on each subset, thereby allowing AND/OR searching within and in addition to the subset which was obtained on previous searches. The results of searches can be individually tagged in order to make further subsets for later searching.

The contents and pointers of the context and source fields are loaded into the available Ram when the database is called up. Any searches using these fields are therefore very quick. Text string searches within the text field are done through disc access, which will be significantly slower.

Once the search fields are selected, and the codes or words specified for each selected field, *Knowledge Organiser* goes through the entire database, counting the number of text entries located. Once the search is completed, each of these entries can be viewed, edited and/or printed by using the *View* menu, moving forwards or backwards within the subset selected by the search routine. If text is searched for within the text fields, it is highlighted within each of the files found having it. Files can be tagged and tagging can produce a resident subset, which can also be searched.

Printing is allowed at this stage, either of the linker fields or the text field as well.

Text or Ascii files can be imported or exported using any of the wordprocessors mentioned. In addition, files can be either directly or indirectly loaded using a Z88 and a serial link. If files are imported, rather than just viewed, they can be edited, up to a maximum of 200 lines each.

A *Knowledge Organiser* utility is included, enabling use of any wordprocessor file which contains some Ascii data for importation. This simply strips out any non-Ascii characters. In addition, files from three online databases – Infocheck, Neris (the National Educational Resources Information Service) and Prestel – can be directly loaded into *Knowledge Organiser*.

The manual supplied with *Knowledge Organiser* is clear and sufficient description is given for each of the aspects of the application.

Knowledge Organiser is available as an upgrade from the original *Arc-TFS* by sending the original *Arc-TFS* disc to Clare's together with £40. The normal purchase price is £59.99.

Knowledge Organiser is a significant improvement on *Arc-TFS*. It could be further improved by allowing the viewing of graphics in scanned text files. Some thought should be given to indexing text files, thereby allowing very quick searches within text fields. It would be useful to see more than 200 lines within a text file.

But for these small complaints, *Knowledge Organiser* provides well for most of the eventualities and requirements of a free text database. It also compares well with MS-Dos free text or text retrieval packages. This is despite the fact that they are, in most cases, much more expensive than *Knowledge Organiser*.

Knowledge Organiser *costs £59.99 from Clare's Micro Supplies, 98 Middlewich Road, Rudheath, Northwich, Cheshire CW9 7DA. Tel: (0606) 48511.*

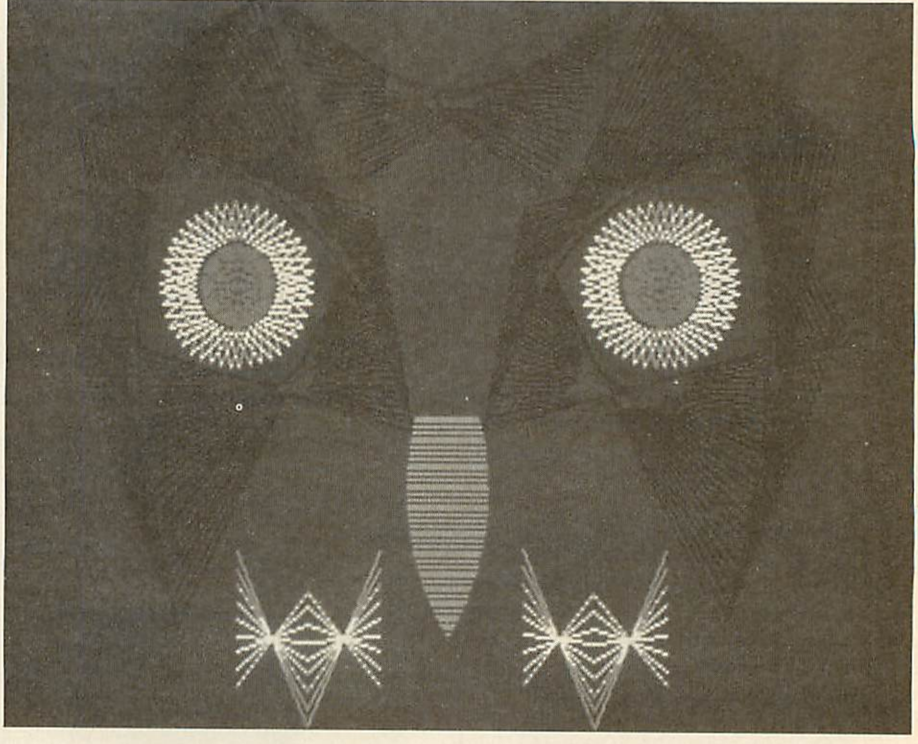
CRAFTY ART

Computing and handicrafts don't have to be in conflict. **DAVE FUTCHER** looks at Craftshop, a package that puts art on the screen of your Arc or A3000

When there is a release from the educational software house 4Mation you can usually expect power and versatility coupled with originality.

4Mation has now released the second of its Archimedes and BBC A3000 packages. In fact it's not one new package but two, with four superb applications on offer. They are *Craftshop 1* and *Craftshop 2*, both of which have been particularly designed with the non-artist in mind. They offer the possibility for anyone to create something worthwhile without too much difficulty.

Each of the two *Craftshop* packs contains two applications. In *Craftshop 1* it is *Patterns* and *Stitching*, while in *Craftshop 2* it's *Embroider* and *Tiling*.



Picture patterns

Two very popular BBC micro packages with schools were *Picture Builder* from Hill MacGibbon and *Picture Craft* from BBC Soft. These allowed children aged six to 16 to create designs and pictures from patterns made from simple shapes.

Patterns is based on the same sort of principle but is by far a more comprehensive, flexible and versatile package with which children of all ages can produce complex designs with comparative ease, merely by selecting and combining shapes into patterns and using the *Craftshop* tools to do wonderful things from relatively simple beginnings.

The pattern editing window provides 20 different shapes around its edge in the form of icons. All the usual two-dimensional shapes like the square, rectangle, circle, and triangle are there, but in addition you've got the diamond, hexagon, pentagon, star, various ovals and segments of circles. These are more than enough shapes to work with.

This comprehensive collection of shapes is displayed around the screen working area. The shapes that a child wants to include in their pattern are selected by using the mouse to move the pointer and clicking. The selected shape then appears in the centre of the working area from where it can be moved into position.



The colour of shapes can be set by using the Fill icon at the top of the pattern editing window and the outline colour of the shape can be set by using the Line icon. Actual colours are selected from a palette that appears on clicking the Fill or Line icon.

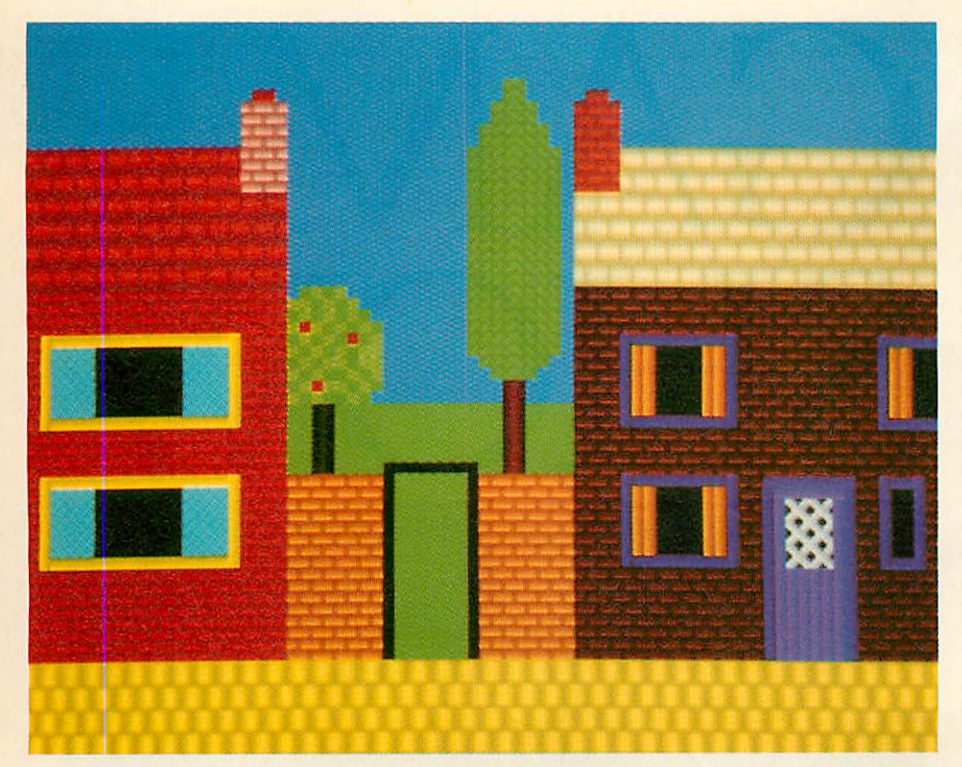
As well as the built-in palette advanced users can grab palettes from another screen and use that instead, offering a wider range of possibilities than is at first obvious.

As well as positioning and colouring, shapes can be simply rotated. This is done after choosing the shape and clicking the mouse Menu button, which brings up a rotation pointer. The pointer is then moved in a clockwise or anti-clockwise direction around the outside of the shape to rotate it.

As well as the special rotation pointer there are other special pointers for tasks like changing the shape's size, or bringing shapes to the front or placing them at the back of the display.

Once shapes have been made into a pattern, the real power of *Patterns* is realised. This is because a pattern can be manipulated in exactly the same way as the individual shapes that make up the pattern. Patterns can be copied and edited. They can also be manipulated in all sorts of ways. All or part of a design can be reflected horizontally or vertically or the design may be inverted horizontally or vertically and both the background and border colours can be changed.

Patterns is an ideal structured art tool, more suitable than the freehand art packages that many children trying computer art for the first time fail with.



A stitch in time

Stitching allows curve stitching to be created on screen, rather than with the usual card and thread. This is a powerful design tool that allows art and mathematics to be explored in two or three dimensions.

The use of *Stitching* is structured around 23 different patterns so the possibilities are considerable. The patterns fall into two categories – 19 are based on lines (straight or curved) and four are based on a circle.

Once the *Stitching* application has been loaded and Select has been chosen from the menu a set of patterns appears on the screen. The pointer is taken to the pattern the child wishes to work with and the mouse clicked.

Once the initial pattern has appeared on the screen, control of the curved stitching is by a system of menus. The main menu offers Select, Rotate, Palette, Filing and Clear. With options from this and other menus the basic designs can be modified by altering the size, the number of threads, the orientation of the pattern and colour.

Stitching has tremendous power. So much can be done with the first and simplest pattern which is a single set of threads between two straight lines. In fact *Stitching* takes curve stitching to its ultimate.

Complex stitching

Embroider, supplied in *Craftshop 2*, is another program linked to needlework techniques but it is completely different to the curve stitching offered by *Stitching*.

Embroider allows complex stitched designs in an embroidery type style to be created using patterns formed by combining stitches. *Embroider* works in mode 15 and offers a full range of 256 colours, multitudes of possible shapes and incredible speed. It is easy to use, with all the tools provided on screen under pointer and menu control. Of course there are a range of ready-made stitches, but for the expert the possibility of user-defined stitches is also offered.





All stitches can be in different colours, and these can be flipped vertically and horizontally. Individual stitches can be grouped and formed into different stitch patterns and these patterns can be formed together into complete designs. A magnifier controlled by the mouse is provided so that stitches can be examined closely.

It is possible to use the application to create pictorial designs. I certainly would not stop children creating some very effective boats, houses, and rural scenes. But *Embroider* is also suited for the creation of designs that are not pictorial, considering colour, pattern and texture.

Although *Embroider* is not intended to be a substitute for the real thing, it does motivate children to try using real canvas and cotton.

Tile it all over

The final package of *Craftshop 2* is *Tiling*, which is designed to be used in conjunction with the *!Paint* application supplied by Acorn on Applications Disc 1.

Tiling allows small designs to be created and repeated across the screen. First the individual tile has to be prepared but that is simple to do using *!Paint* to make a painted sprite. This may well provide quite young children with their first experience of multi-tasking.

The program provides 41 different tile patterns, with the first 30 defined and ready to use. If this is not enough, there are three different styles of tiles that further develop the possibilities. The size of tiles can be varied on a horizontal and vertical scale from one to 15 giving 225 different sizes.

Just as with *Stitching* there is plenty that can be done with *Tiling* just by 'keeping it simple' and working with the basic square shape – Pattern 0.

There is no doubt that *Tiling* offers some wonderful possibilities for children to explore pattern-making using tesselations. But for any teacher wanting their class to explore geometric patterns, the application cannot be beaten.

Conclusion

Craftshop 1 and *Craftshop2* offer the non-artist something that few art packages normally do. With these packages and an A3000 I believe most children (all I tried it with) will succeed with using art and craft techniques to produce work they will be immensely pleased with.

With *Craftshop 1* and *Craftshop 2* Mike Matson's 4Mation Educational Resources has begun to make use of the true potential of the 32-bit computer in schools. The company's *Jigsaw* was good, but hardly revolutionary. The *Craftshop* series, on the other hand, breaks new ground.

Craftshop 1 *and* Craftshop 2 *are published by 4Mation Educational Resources, Linden Lea, RockPark, Barnstaple, Devon, EX32 9AQ (Tel (0271) 45566) and cost £29 for each disc.*

A GAME SHOW

As usual, around this time of the year, there isn't really much going on. Hopefully this is just the calm before the storm. The imminent *BBC Acorn User* has a few tricks up its sleeve; you'll just have to wait until then.

As we've only previewed *Apocalypse*, I'll spend a little time taking an in-depth look at the game. I've been sent a few tips on gameplay and general tactics from Anthony Aldred for Fourth Dimension's masterpiece.

A reasonably good score (something in excess of 8000 points) will ensure that you are rewarded for your troubles with extra equipment. In order to proceed quickly you should hit the high-scoring objects first. The black monoliths are worth 2000 points each and understandably require a considerable amount of firepower to destroy them.

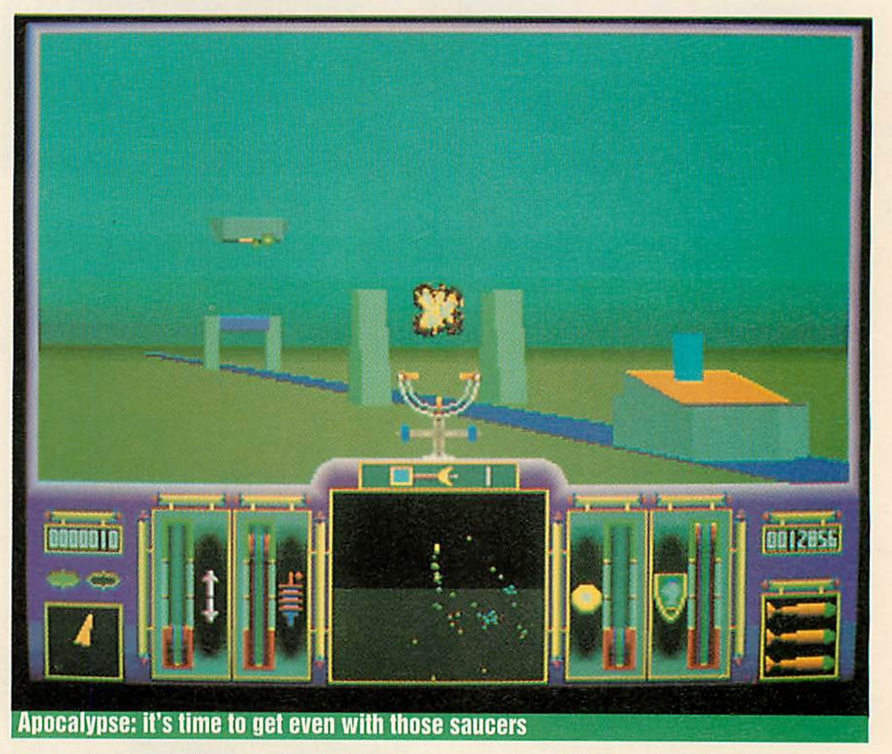
First position your ship so you're facing a monolith head on and it's positioned in the centre of your laser sights. Next, without moving the mouse, reverse the ship (middle mouse button) until you can just see the monolith. Finally, lower your ship to the ground (with the down cursor key) and then move towards the monolith, firing rapidly. If you are on course, the monolith should finally explode and a congratulation message is printed.

Success in the first sortie will give you a device which keeps your ship's temperature down. More importantly, the second sortie will provide you with another gizmo which allows you to rotate your ship instantly through 90 degrees.

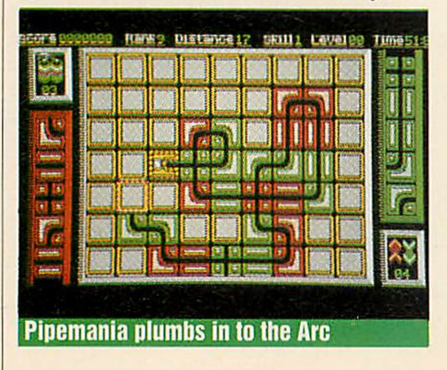
With the next doodad you acquire, it's finally possible to clear the saucers easily. Move up (into the air) as far as possible and fly away from a saucer. It will follow you but you'll be able to outrun it. When you are about the 'width of the scanner' from the saucer turn, face it and shoot.

The Arc version of the highly-acclaimed *Pipemania* should be appearing soon. The game follows the same ideas as the Beeb original, but uses the Arc's high-res colour graphics and sound to enhance game-play.

All levels are based on such themes, as Roadworks, Romans, and Futuristic. *Pipemania* will hopefully make people sit up and look at what the Arc can really do.



Apocalypse: it's time to get even with those saucers



Pipemania plumbs in to the Arc

One major moan from readers is that the Game Show doesn't cover the Beeb market any more. Since the arrival of the Arc, the number of games produced for the Beebs dropped significantly.

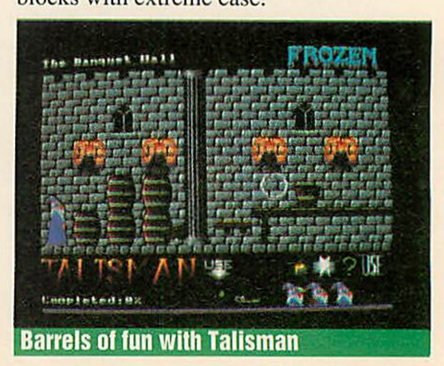
There are several projects on the way, *E-Type* from Fourth Dimension for example. The trend seems to be quality rather than quantity, so all is not lost. The Beeb is still an excellent machine and any game programmers/manufacturers reading this should think twice about ignoring it in favour of 16/32 bit technology.

Rob Miller

Talisman

Minerva Software tel: (0392) 437756
Archimedes / A3000 £14.95 disc.

Minerva has certainly been busy lately. Four new games in a couple of months, and this is one of its best yet. *Talisman*, by Andrew Catling, is a beautifully smooth arcade-adventure which features large sprites and complicated object-based puzzles. It combines elements of the Beeb games *Imogen* and *Spellbinder* but looks and sounds far better than either of these. Flickering has been banished and a clever slotting together of graphics taken its place, which manages to disguise the fact that they are separate blocks with extreme ease.



Barrels of fun with Talisman

The plot runs as follows: The evil Baron steals the sacred talisman, shatters it into six pieces and hides them in various inaccessible extremities of his castle, which happens to be infested with the usual hordes of supernatural undesirables. You have been despatched by the King to recover and repair the talisman, and give the Baron and his cronies a ticking off. The wizard whose role you take is able to cast four different spells and with the right ingredients, he can alter his form and species. This has its advantages and its drawbacks. He can become a mouse (who can reach into small places, but cannot jump) a bird (who can fly, but is unable to manipulate objects) and one other creature I will leave you to discover. The fourth and most powerful spell is that of teleportation.

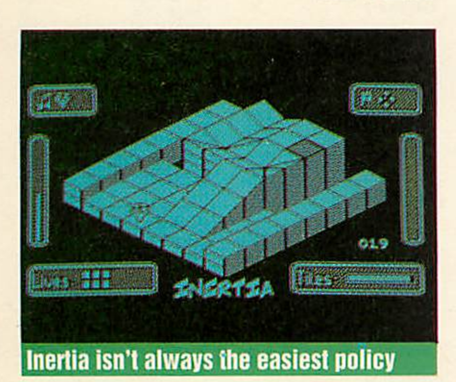
Your wizard, in his rather fetching purple robe, can carry two objects at a time. The player then pauses the game in order to make use of these objects in various ways, with the help of icons.

All the game's graphics are impeccably drawn, and well masked, allowing objects, scenery and characters to interact, passing in front, behind and even through each other, creating a marvellous pseudo-three dimensional effect.

If I have any criticisms, they would be that the edge-detection routines are a little inaccurate, and that too few sampled sounds have been used, perfect though the current ones are. Otherwise this is a real Minerva cracker and will sell like hot-cakes.

I could give you some hints, but instead, I'll leave you to study the scrolling message which contains a couple. If I were you, I'd start saving up your pennies to buy a copy of *Talisman*.

Mat Tizard



Inertia isn't always the easiest policy

Inertia

The Fourth Dimension; tel: (0742) 700661
A3000/Archimedes: £19.95, BBC/Master disc: £12.95, Compact disc: £13.95, BBC/Electron cassette: £9.95

In *Inertia* you are invited to pilot a little whirlwind-shaped ship over a landscape of tiles all of which are joined together to form a massive maze of twists, turns, ramps, hills and channels. Your ship is of the thrust in one direction and keep moving type, meaning that you will need to fire in the opposite direction to stop or slow down.

To stay alive you will not only need to keep away from the edges but also glide over special shaded tiles, as well as giving you points they will reset the timer, which will kill you if it reaches the top of its travel. A neat, if unoriginal little idea that sometimes has you charging about in a desperate and careless search to save your ship.

The view is orthogonal, as in games like *Knightlore* and *Marble Madness*, the former of which this game is very loosely based on. Three-dimensional plotting routines are notoriously difficult to implement on two dimensional screens. Unfortunately the feeling here is that your craft very often appears to be completely detached from the landscape – before you realise it you have blundered off the edge, resulting of course in a quick bzzt! sound which signals the demise of your ship.

A minus point here is that only a very small section of the landscape is visible. More than often I found myself with nothing to support me, followed of course by a quick bzzt!

Various tiles, which have adverse effects on your ship add interest and generally spice up the gameplay. They reverse controls, speed you up, slow you down and generally provide the much needed 'Arggggh!!' of the game. Tiles which are of more use are jump tiles which propel your ship in a vertical direction, which I can say takes a bit of imagination to visualise!

Overall, *Inertia* is an addictive little game that will keep you coming back for more.

Paul James

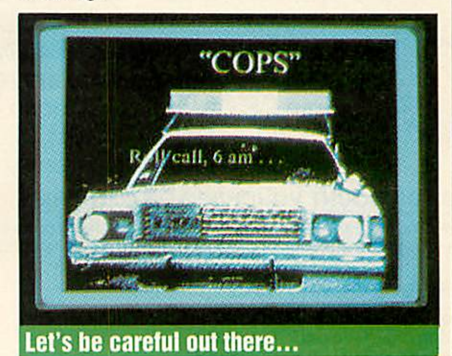
Cops

Alpine Software; tel: (0762) 342510
A3000/Archimedes: £19.95, Compact disc: £14.95 Master/Electronic disc: £13.95

This is an adventure game based very loosely on the cult American show *Hill Street Blues*. In the briefing room at 6am (errgh!) you are told that the police chief has been kidnapped, and that you and your partner, named Rob O'Cop (groan!) are to investigate bullies taking kids' money from outside the school.

As things progress, you discover more and more about the kidnapping of the chief. Despite your rather diminutive posting, you are the one trying to solve the kidnapping, or not as the case may be.

Parsing gets the adequate mark but the replies are a little unhelpful and very repetitive. Where this adventure scores highly is in the quality of the puzzles. Just the right difficulty, for me anyway. Also very good is its system of getting input from the adventurer. Words can be selected from any text on the screen by pointing the mouse and clicking.

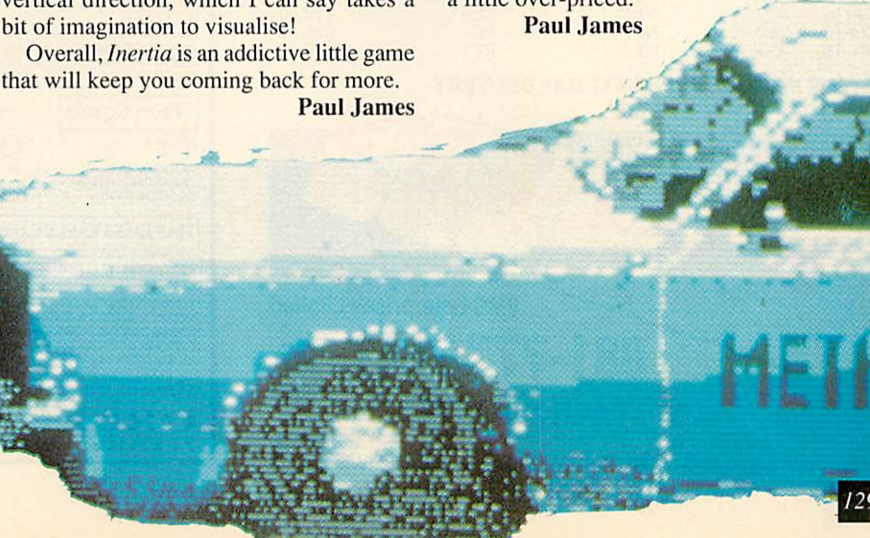


Let's be careful out there...

This is a brilliant idea that makes typing in long sentences a doddle. Just plucking the words from the screen eliminates the possibility of a fatal spelling mistake.

All in all, *Cops* was fun to play and complete, the latter only because I had the solution, (perks of the job!), but it may be a little over-priced.

Paul James



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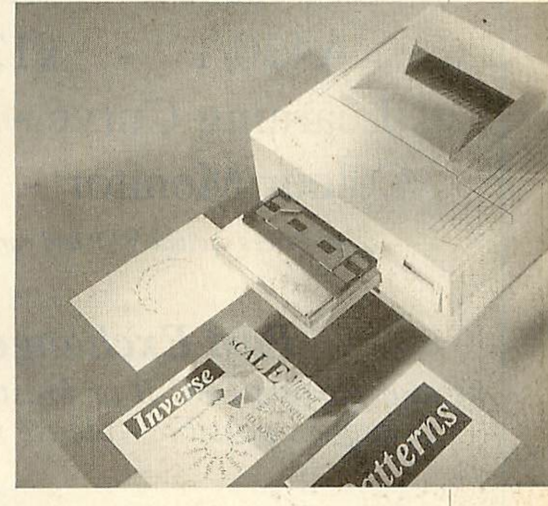
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GOING STRAIGHT

Anti-aliasing for printers? GRAHAM BELL asks whether one 300-dots-per inch laser printer can really be better than another 300 dots-per-inch laser printer



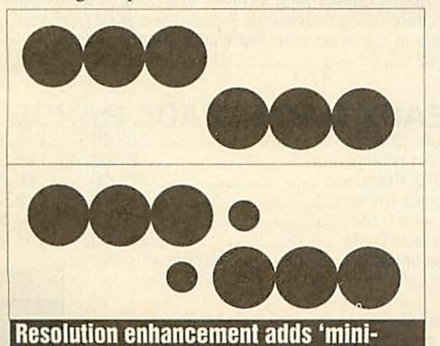
Hewlett-Packard's Laserjet III is the 'Epson FX80' of the laser printer world. This is the machine which other laser printers, like the Qume Crystalprint Series 2, seek to emulate. And Arc owners are provided with a Laserjet printer driver for Risc OS, which allows any Risc OS application to use the Laserjet to its best advantage.

Laserjet compatibles are often cheaper, smaller, and some provide better print quality than the original Laserjet. But Hewlett Packard has just moved the goalposts by upgrading the 'standard'. Its latest Laserjet III retains all the features of its predecessor, and improves on it.

To look at, the new model is slightly 'dated' – a squared-off ribbed box looks less up-to-the-minute and streamlined than the previous model. It's big too, so don't rely on tucking it into a spare corner. The paper tray sticks out at the front and it needs space at the rear for the lid to lift up.

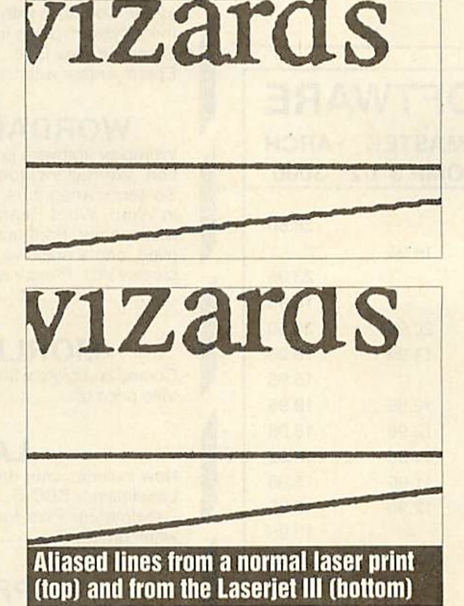
As you'd expect from Hewlett Packard, the construction is excellent: the whole thing feels strong and well-built. The buttons on the front have a real click, and aren't the membrane switches you normally get. They are accompanied by a clear LCD panel, and it's reasonably easy to use – a test print takes a matter of moments.

Using the printer with a BBC model B or a Master is perfectly feasible. It's quick (a complete three-page letter is printed in 30 seconds), the default font is a pleasing Courier, and setting up a *View* printer driver using the printer driver generator is easy (the table gives the control codes you need).



Resolution enhancement adds 'mini-pixels' to reduce 'jaggies'

With an Archimedes, the printer really comes into its own, although it loses any pretence to speed and you'll need to add an extra megabyte of memory to allow a whole page of graphics. Printing is a matter of dragging your drawing file icon, or whatever, onto the printer driver icon. Because everything is printed in graphics mode, and up to a megabyte of data has to be sent to the printer for each page, it can take several minutes (more if you want to print sideways). But the quality is excellent.



Aliased lines from a normal laser print (top) and from the Laserjet III (bottom)

The major new feature is 'resolution enhancement'. In essence this mirrors the Archimedes' anti-aliasing of text, but it applies to text, graphics, everything – and it even works with plain text from a Beeb. The laser system still puts down dots of toner at 300 to the inch. But it adds extra, smaller dots at the edges of curves and around near-horizontal lines in order to smooth out the jagged edges. The example shows the effect. Some experimentation with the resolution enhancement controls pays dividends, but once you've set it, you don't need to do anything – it's all automatic and doesn't need any special software. And it really does work.

Along with the resolution enhancement, the Laserjet III has a set of scaleable outline typefaces built-in. It has Times and Univers, each in four weights, and uses the Compugraphic Intellifont font scaling system – similar, but compatible with neither the Arc's font system nor Postscript. Because of this, you can't make any real use of the printer's own scaleable fonts.

But there are a couple of other possibilities with the Laserjet III. First you can add a cartridge that turns it into a Postscript printer (the total cost is less than just about any other Postscript machine). And second, it is compatible with HPGL, the Hewlett-Packard plotter control language.

So it's a do-it-all printer – smarter than the average laser, Postscript if you need it in the future, and you can even use it as a plotter occasionally. For a business with an Arc (or even a Beeb) this could be the printer to impress your clients. It's the biggest advance in affordable print quality since the laser printer itself.

initialise	ESC "E"
underline on	ESC "&" "d" "0" "D"
underline off	ESC "&" "d" "@"
bold on	ESC "(" "s" "3" "B"
bold off	ESC "(" "s" "0" "B"
pound sign	ESC "(" "1" "E" "#" ESC "(" "8" "u"

Table 1. Control codes for View printing

Hewlett-Packard Laserjet III; typical retail, £1500 including a year's maintenance. An extra 1Mb of memory costs £240.35 from Technomatic on 081-205 9558. The company charges £470.35 for the Postscript cartridge.

A WORD TO THE WISE

Swamped by sheer volume of correspondence? **DAVE FUTCHER** looks at Corplan, a management program that promises to help organise your files

Computer Concepts' *Wordwise Plus* is a very widely used BBC wordprocessor and is also a very flexible package because of its built-in programming language.

Since its release in 1984, a number of excellent products have appeared that have made good use of the *Wordwise Plus* programming language (WWPL). There were Beebugsoft's *Wordease* and Watford Electronics' *Wordaid* both of which added mail merging and label printing as well as other facilities.

Now there is *Corplan*, a comprehensive application written by Colin Robertson, which extends *Wordwise Plus* into a correspondence management tool. It adds descriptive indexes of documents, libraries of form letters and addresses for use in mail merging and label printing.

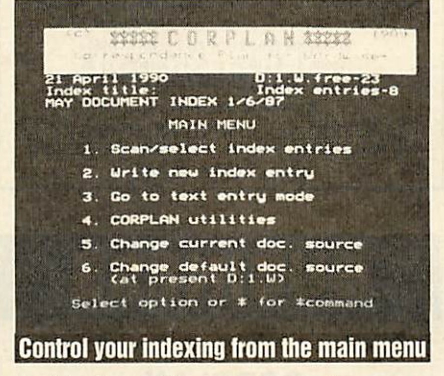
Getting started

Corplan has two essential parts. The first part contains the system files which run everything using menus and the second part deals with the storage of document files.

Starting up *Corplan* is achieved by booting the system disc. The !Boot file contains parameters that can be set by the user. These include printer form length, dateline style, the *Spellmaster* dictionary filename and the Ram bank it is to be stored in. Once booted, *Corplan* identifies a document source and loads its index into memory.

Corplan's main menu shows the title and several status lines. These include the current date, which is loaded automatically with a Master 128, and several pieces of information about the filing system and the drive. Also included is the name of the document index and the number of entries in the present index as well as the available catalogue space.

The main menu contains six options. Options one to three are starting points for the *Corplan* cycle. One of the central parts of the package is its document index facility. This allows you to list documents stored on this disc with names larger than seven characters. Documents can be indexed by the user's own chosen description of up to 30 characters.



Control your indexing from the main menu

Adding new entries to the document index could not be simpler. There is no difficulty writing an index file. With *Corplan* it's automatically done with Option 2. You follow the prompts and within seconds a new document is indexed.

If you are starting a new document you choose Option 3 and this takes you to the text entry mode. You can go straight to the normal empty *Wordwise Plus* text area, or you can go into *Corplan*. Before you are dropped into the text entry mode you are offered the option of using the Forms menu.

From this menu you can select from up to 22 different forms. Initially *Corplan* comes with six set up ready to be used. The idea of these forms is to enable layouts to be precisely replicated without the user having to remember a complex sequence of embedded commands.

Keeping track of those elusive letters

This aspect of *Corplan* enables documents to be created quickly and accurately, eliminating much keyboard activity. The forms concept is also of particular value in *Wordwise Plus* where you cannot see the true layout of your document while you are typing it. Using the Forms selection system alone can save many hours of difficulties.

Corplan also has a built-in program that writes information like dates, addresses and references, to their pre-defined location in the letter. This means that difficult document layouts can be reproduced precisely without too much trouble.

The fourth option calls up the *Corplan* utility menu which offers a number of important wordprocessing features like mail merge and address labelling. There have been many similar utilities but none have been integrated in this way.

Corplan's mailmerging utility is called *Cormerge*. It's ideal for producing client lists for a small business or for a club secretary dealing with membership distributions. One aspect that is particularly good is that the required addresses can be picked out from one or more address files. This is done with *Corlist*.

A *Corplan* address file is simply a *Wordwise Plus* document containing a list of addresses and related data formatted in a particular way. This formatting is very important because it is used by *CorAdrs* to find its way when searching records.

The utility menu also offers a useful Ascii text deformatter which removes leading spaces and single carriage returns from an Ascii text file which has been loaded into the main text area.

Conclusion

Corplan works well on any BBC 8-bit machine – model B, B+, Master 128 and Master Compact, as long it has some sort of disc filing system. A range of virtually any one will do, whether it is Acorn DFS or ADFS, Watford DFS or DDFS, or the Opus DDOS.

On a DFS machine two drives are best but one double-sided drive will do.

This is a complete integrated package which will stop *WW+* users searching out particular utilities they normally use for label printing and mail-merging. But to me it is the potential for using templates easily and the document indexer that makes it a package that I'll be running alongside *Wordwise Plus* in future.

Corplan *is available from Colin Robertson at Three Gables, 7A Talbots Road, Maidenhead, Berks, SL6 4LZ. It will operate on any machine in the BBC micro series using a range of disc filing systems. The Package costs £19.50.*

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COUNTER CULTURE

Can the BBC Compact soup up the daily paper round? CHRISTINA NEAL looks at the automated newsagent





Several years ago, getting an accurate paper bill from your newsagent wasn't always an easy matter. The poor shopkeeper would have had to sift through every name in his record book to establish how much you owed – and a typical newsagent serves an average of 1000 customers.

With no dishonesty intended, you could be billed for a magazine you didn't order, or end up forking out for something you did want that failed to arrive!

But for the ever-suffering newsagent, the problems of using a manual system didn't end there.

If a magazine or newspaper went up in price, they would then have to scan through every single name merely to amend the accounts of those who received that particular publication.

In short, the old-fashioned record book was, for the most part, very long-winded and ineffective.

Several companies devised solutions – computerised systems for storing customers' account details. Most of them ran on IBM machines with hard disc drives, and the brains behind them boasted that no other computer could cope with the same task.

However, Ken Humphreys and David Young knew better. An electrical engineer by day, Ken was a keen fan of the Beeb and began attending computer courses to boost his knowledge.

At the same time, David was managing a network of newsagents in the Buckinghamshire area.

They soon realised that their combined knowledge of computers and the newspaper trade could give birth to a Beeb-based newsagents' system.

'We spent about a year developing the first system which ran on the BBC model B,' recalls Ken. 'It was 12 months of hard slog. We worked every night, often right through until six in the morning.'

Fortunately, the end result was worthwhile. *Beebnews* was completed and marketed under the pair's newly-formed company, Iver Computers. It sold 25 copies in its first year, before being adapted to run on the Master Compact.

Five years later, they have sold around 75 systems at £2,000 a time. The system comes complete with a Master Compact, plus a monitor and cash till, a Star tallyroll printer and a Citizen 180E printer which produces receipts and invoices.

'The machine literally sits on the counter,' explains Ken. 'It's menu-driven so all the user needs to do is load the first line of the customer's address to find out how much they owe.'

'You can also alter the price of a publication on-screen simply by tapping in the name. Once you've done that, it will amend the price on every account that has that particular publication.'

Another useful feature of *Beebnews* is its ability to keep a record of unsold publications returned to wholesalers. This is especially useful for chasing up outstanding credits due from the wholesalers. Of equal importance is that the system is easy to use.

'Most options can be accessed purely by choosing one command from the menu,' says Ken. 'Unlike most systems, it won't crash if you try and enter a wrong command into it. Instead, it will tell you where you're going wrong and how to put it right. That said, we do provide on-site technical training to introduce people to the machine.'

In addition, all records are stored to disc so that a sudden power cut won't wipe out the data. It can also keep a record of the customers' holidays so that the newsagent knows not to deliver their papers.

Overall, *Beebnews* is an obvious time-saving tool for newsagents. Encouraged by its success, Ken and David are presently upgrading it to run on the BBC A3000 so that newsagents can scan through their records even faster.

The new version will be available in August under the new name of *Pro News*, but existing owners of *Beebnews* can upgrade their machine for around £600.

'We opted to call it *Pro News* because we're aiming the system at newsagents who care about giving their customers a wide selection of magazines to choose from,' says Ken proudly.

With most 'professional' newsagents stocking over 750 different publications, there certainly seems to be a need for *Pro News*. And with new magazines being launched all the time, there could be an even greater demand for it in years to come.

Iver Computers can be contacted at: 8 Holmsdale Close, Iver, Bucks SLO 9HY. Tel: (0753) 651990



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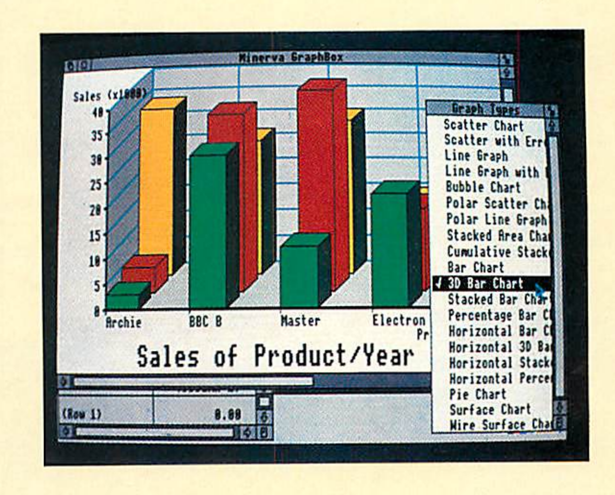
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